VOLUME LV
NUMBER ONE

THE NATIONAL GEOGRAPHIC MAGAZINE

JANUARY, 1929

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ARTICLES and photographs are desired. For material which the Magazine can use, generous remuneration is made. Contributions should be accompanied by an addressed return envelope and postage.

IMMEDIATELY after the terrific eruption of the world's largest crater, Mt. Katmai, in Alaska, a National Geographic Society expedition was sent to make observations of this remarkable phenomenon. Four expeditions have followed and the extraordinary scientific data resulting given to the world. In this vicinity an eighth wonder of the world was discovered and explored—"The Valley of Ten Thousand Smokes," a vast area of steaming, spouting fissures. As a result of The Society's discoveries this area has been created a National Monument by proclamation of the President of the United States.

AT an expense of over $50,000 The Society sent a notable series of expeditions into Peru to investigate the traces of the Inca race. Their discoveries form a large share of our knowledge of a civilization waning when Pizarro first set foot in Peru.

THE Society also had the honor of subscribing a substantial sum to the expedition of Admiral Peary, who discovered the North Pole.

NOT long ago The Society granted $25,000, and in addition $75,000 was given by individual members to the Government when the congressional appropriation for the purpose was insufficient, and the finest of the giant sequoia trees of California were thereby saved for the American people.

THE Society is conducting extensive explorations and excavations in northwestern New Mexico, which was one of the most densely populated areas in North America before Columbus came, a region where prehistoric peoples lived in vast communal dwellings and whose customs, ceremonies, and name have been engulfed in an oblivion.

TO further the important study of solar radiation in relation to long-range weather forecastings, The Society has appropriated $60,000 to enable the Smithsonian Institution to establish a station for four years on Mt. Brukkaros, in Southwest Africa.

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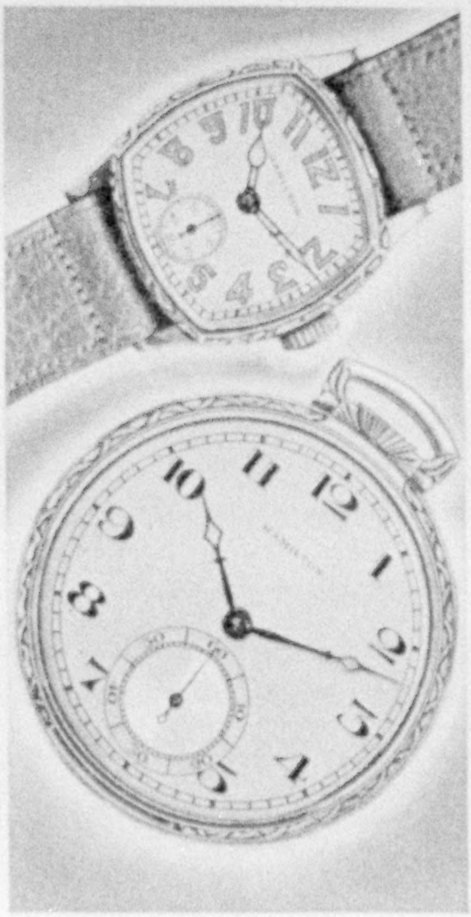

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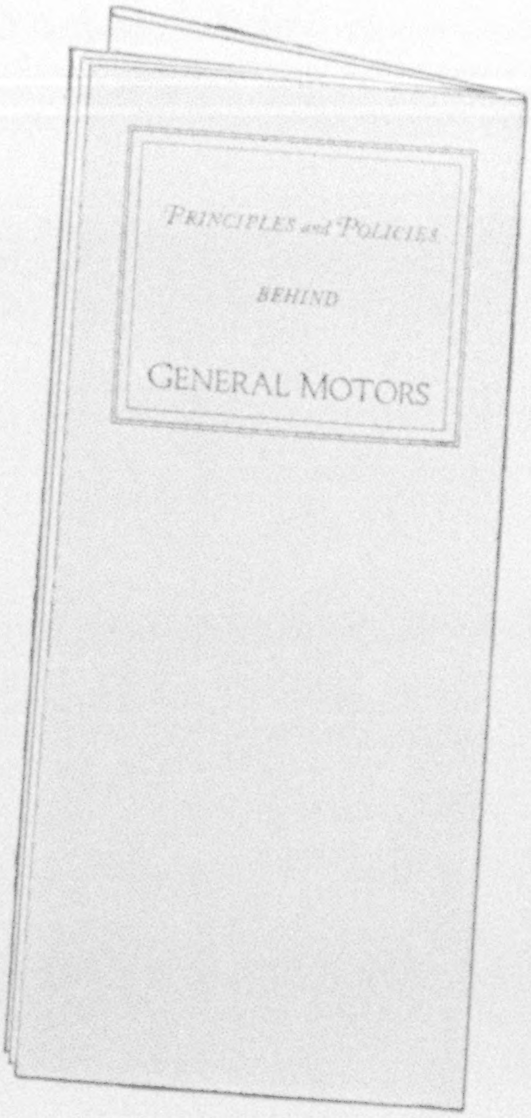

In addition to its Annual Report and Quarterly Statement of Earnings, it is the custom of General Motors to issue special booklets from time to time for the information of its stockholders, employees, dealers and the public generally. Many of the principles and policies, outlined in these booklets, apply to every other business as much as they do to that of General Motors

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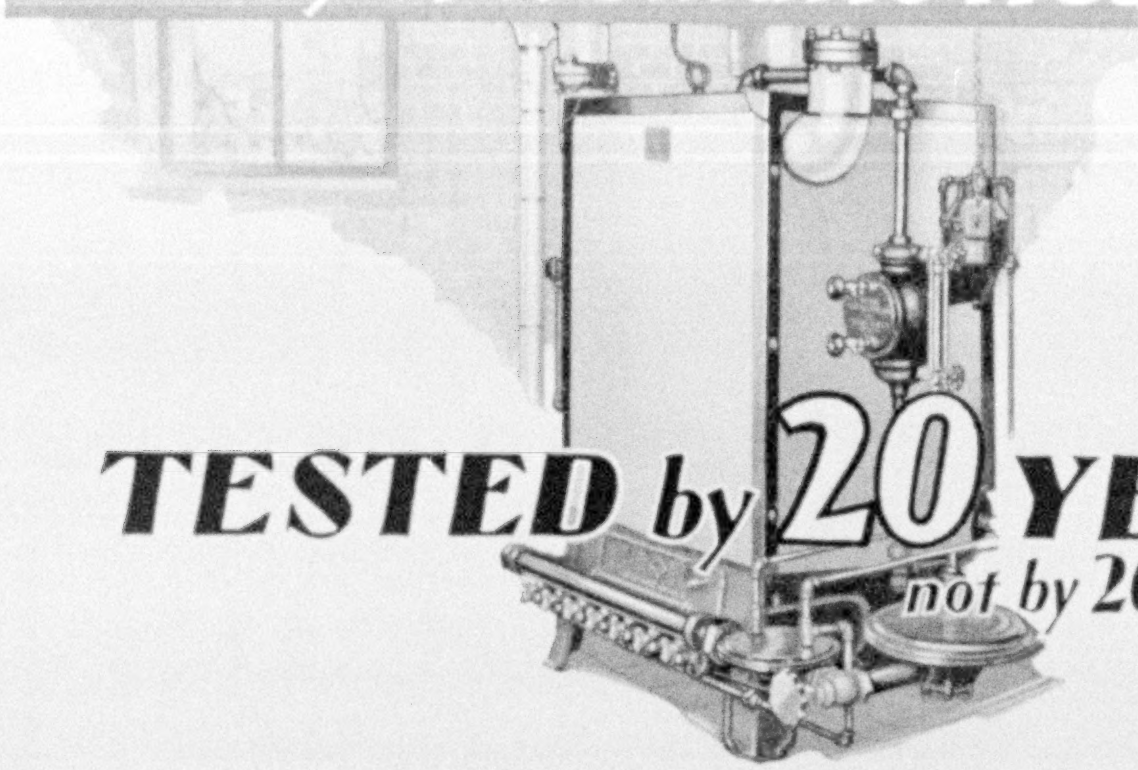

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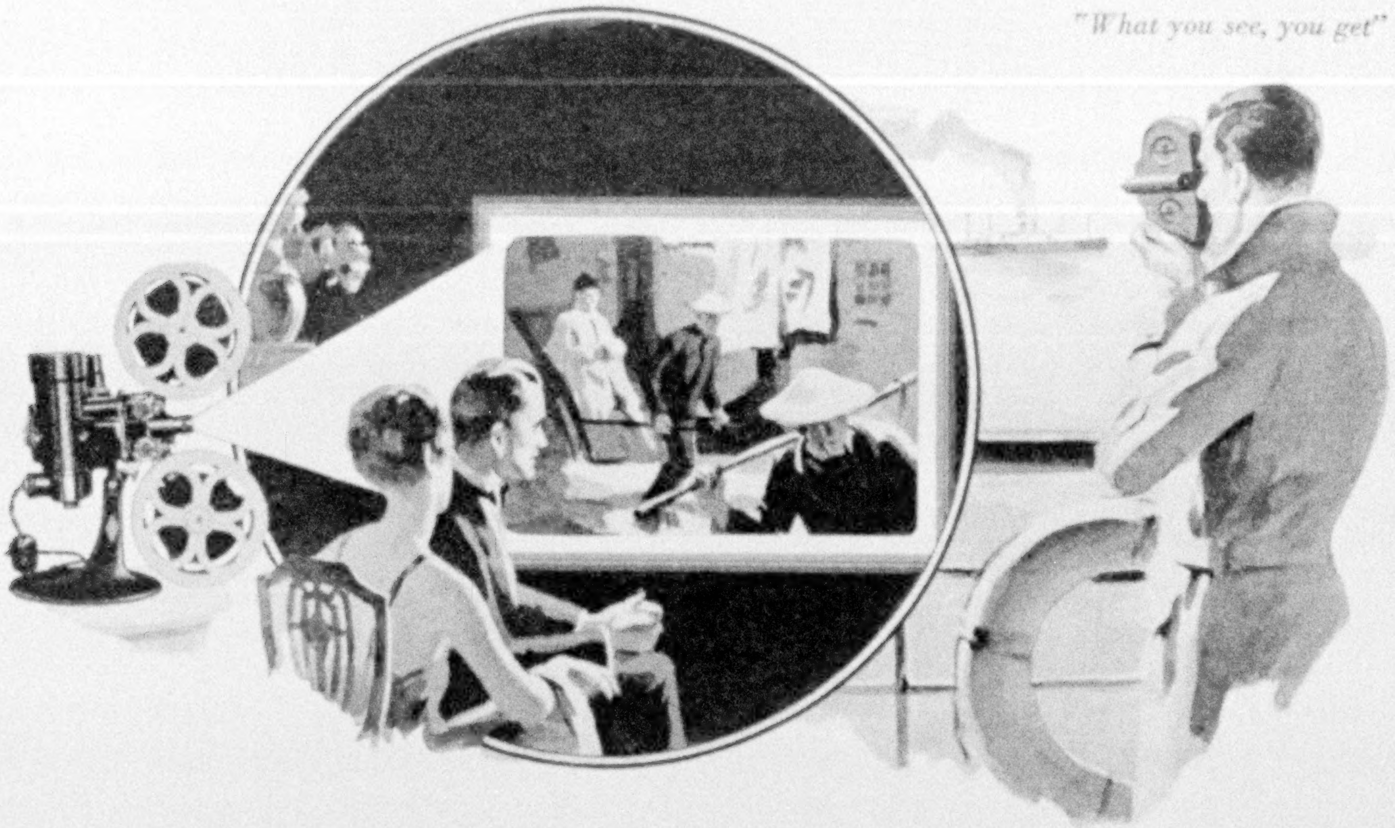

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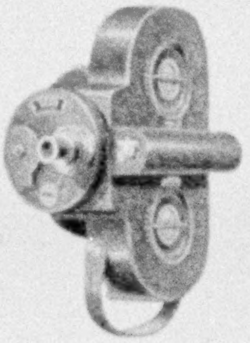

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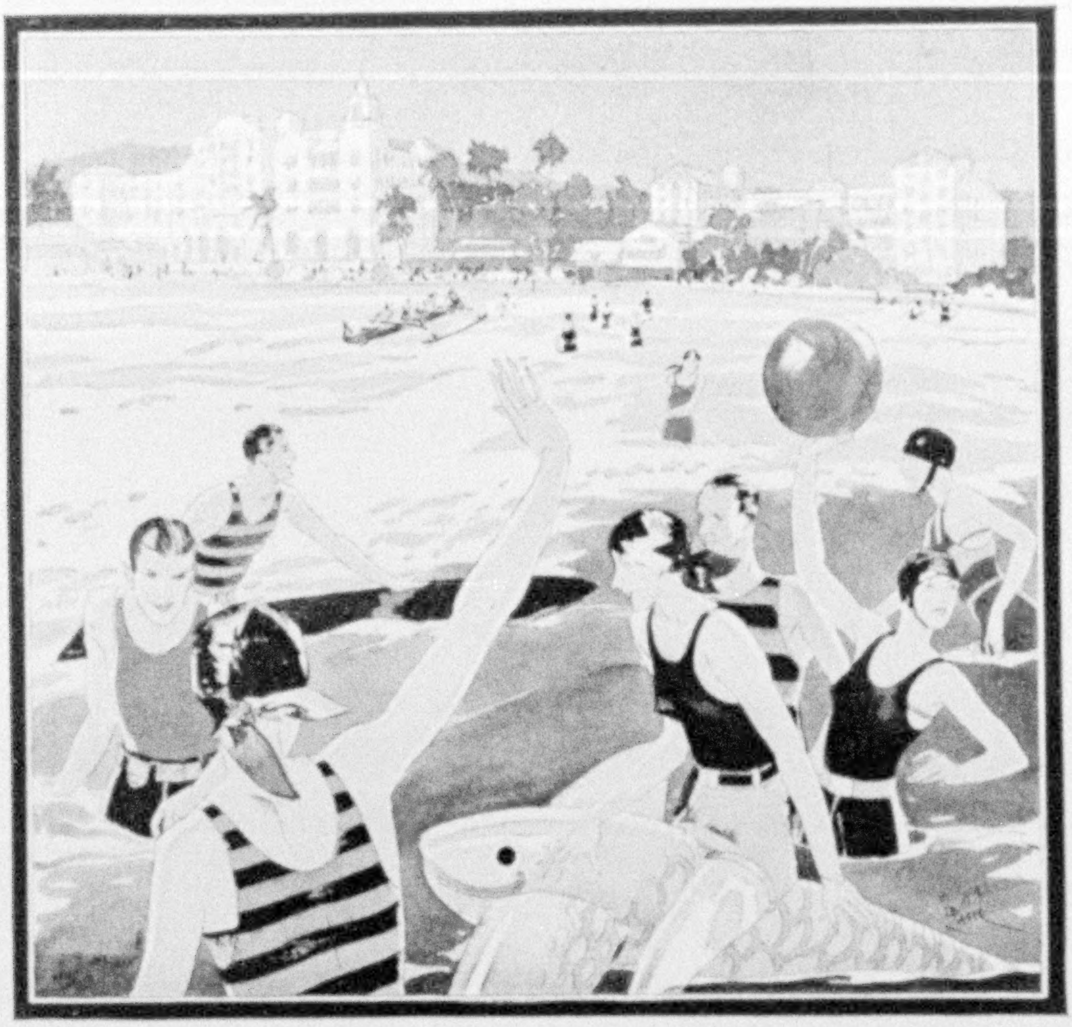

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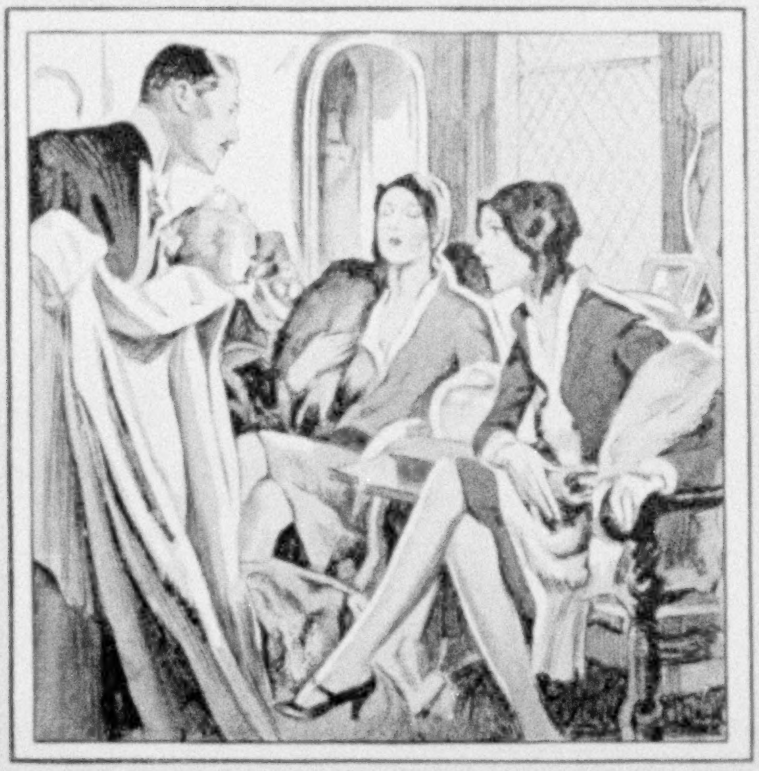

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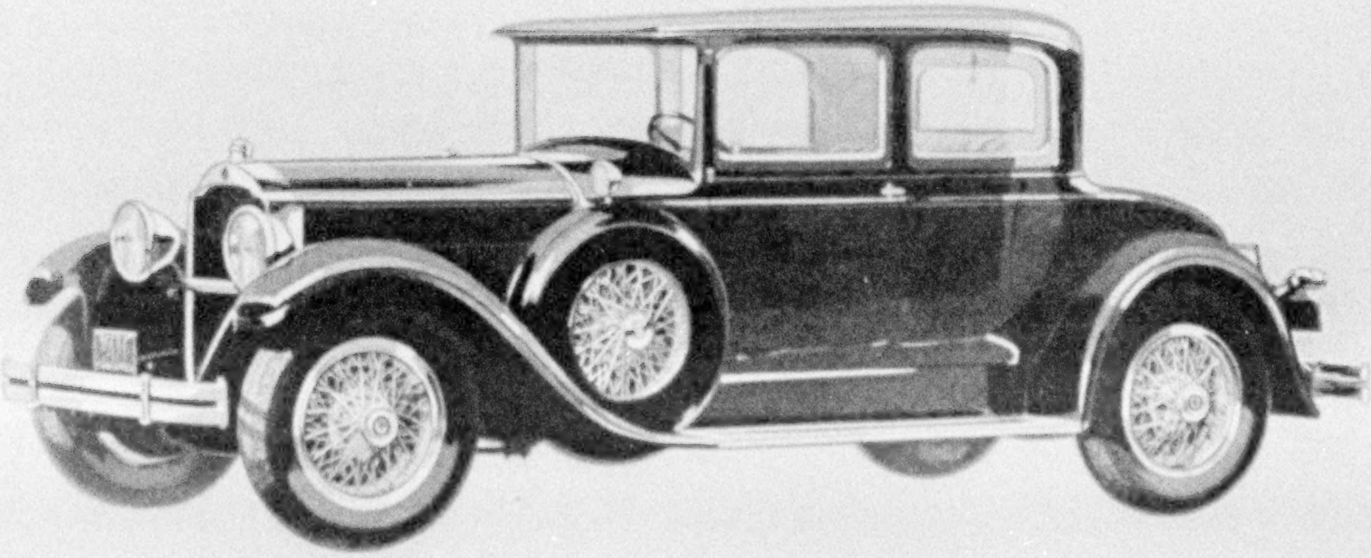

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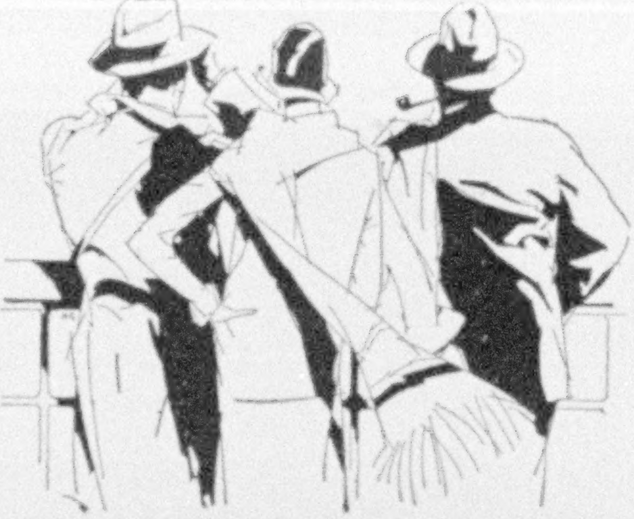

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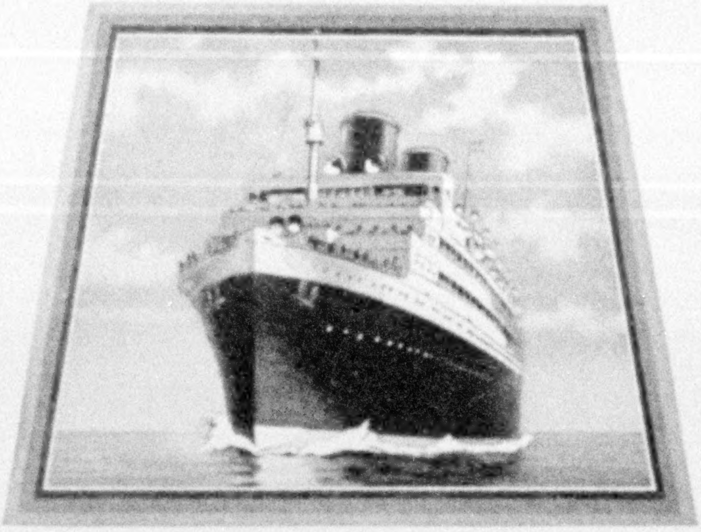

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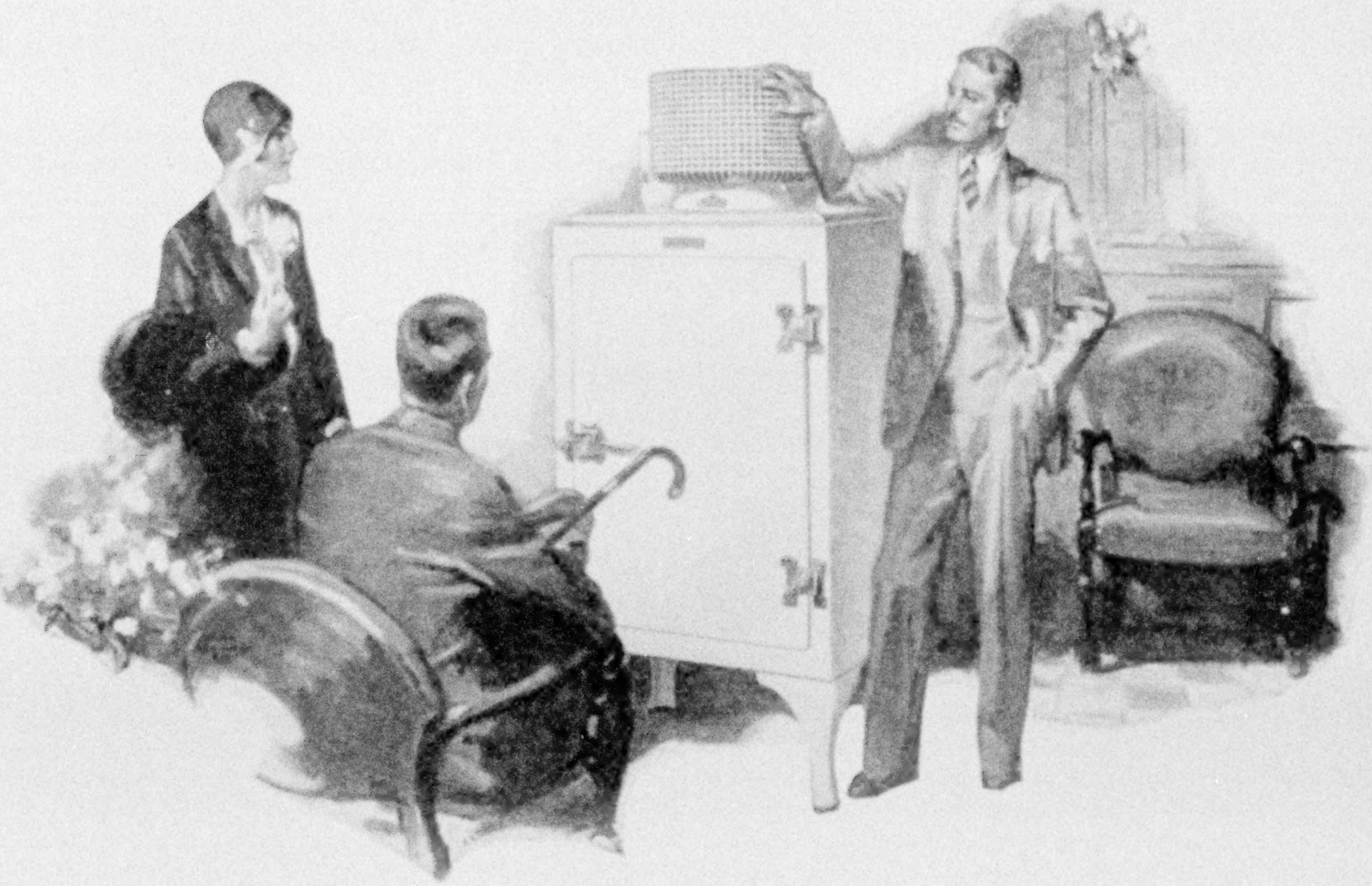

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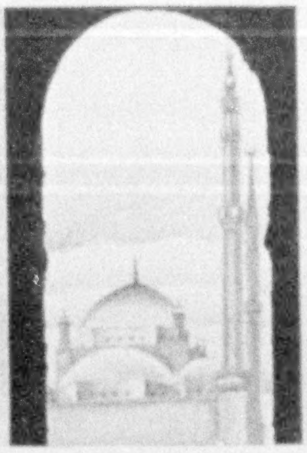

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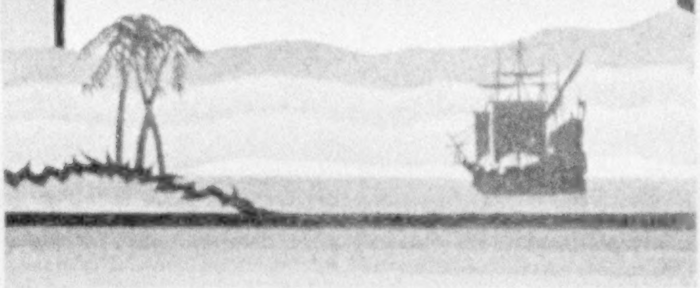

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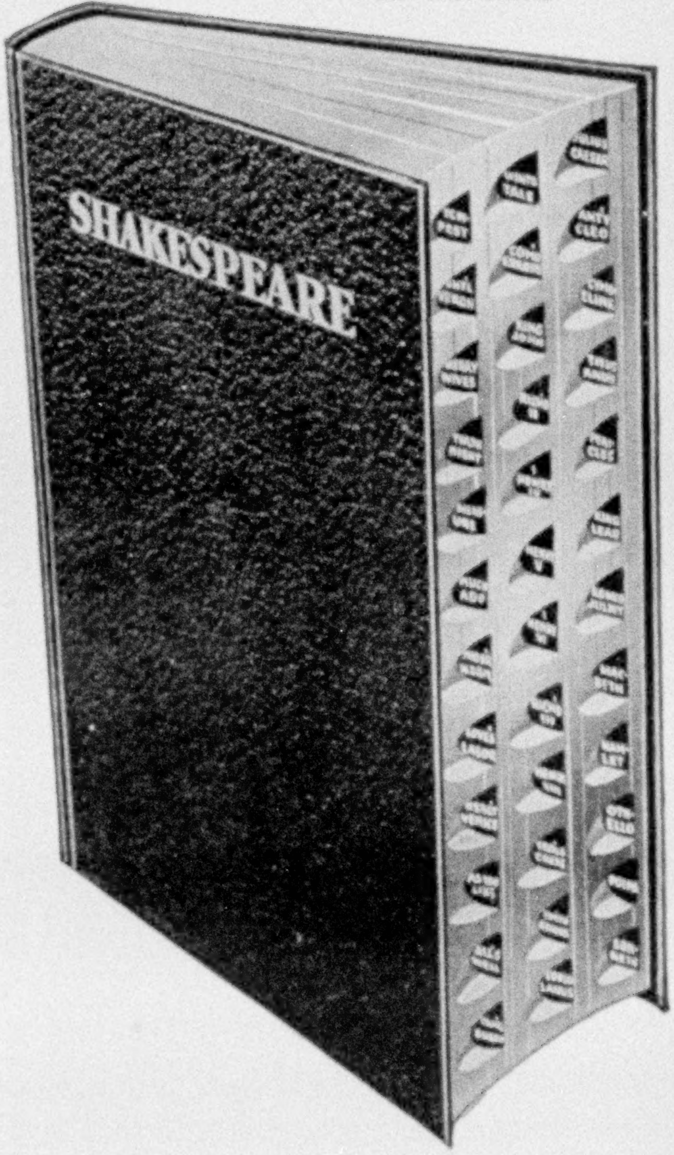

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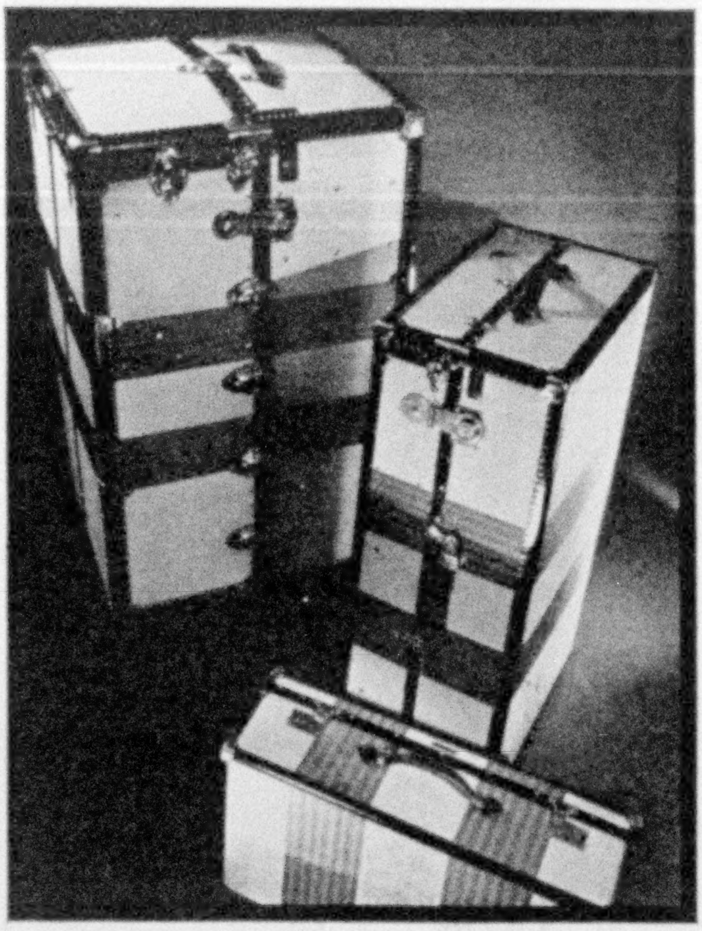

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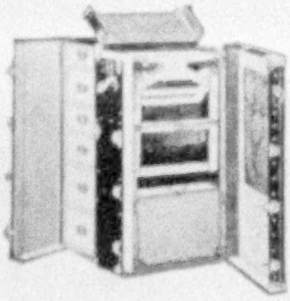

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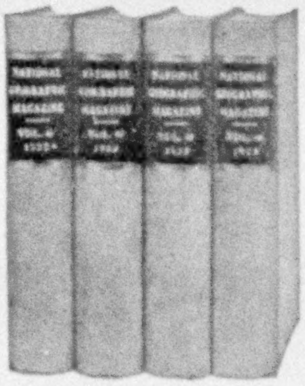

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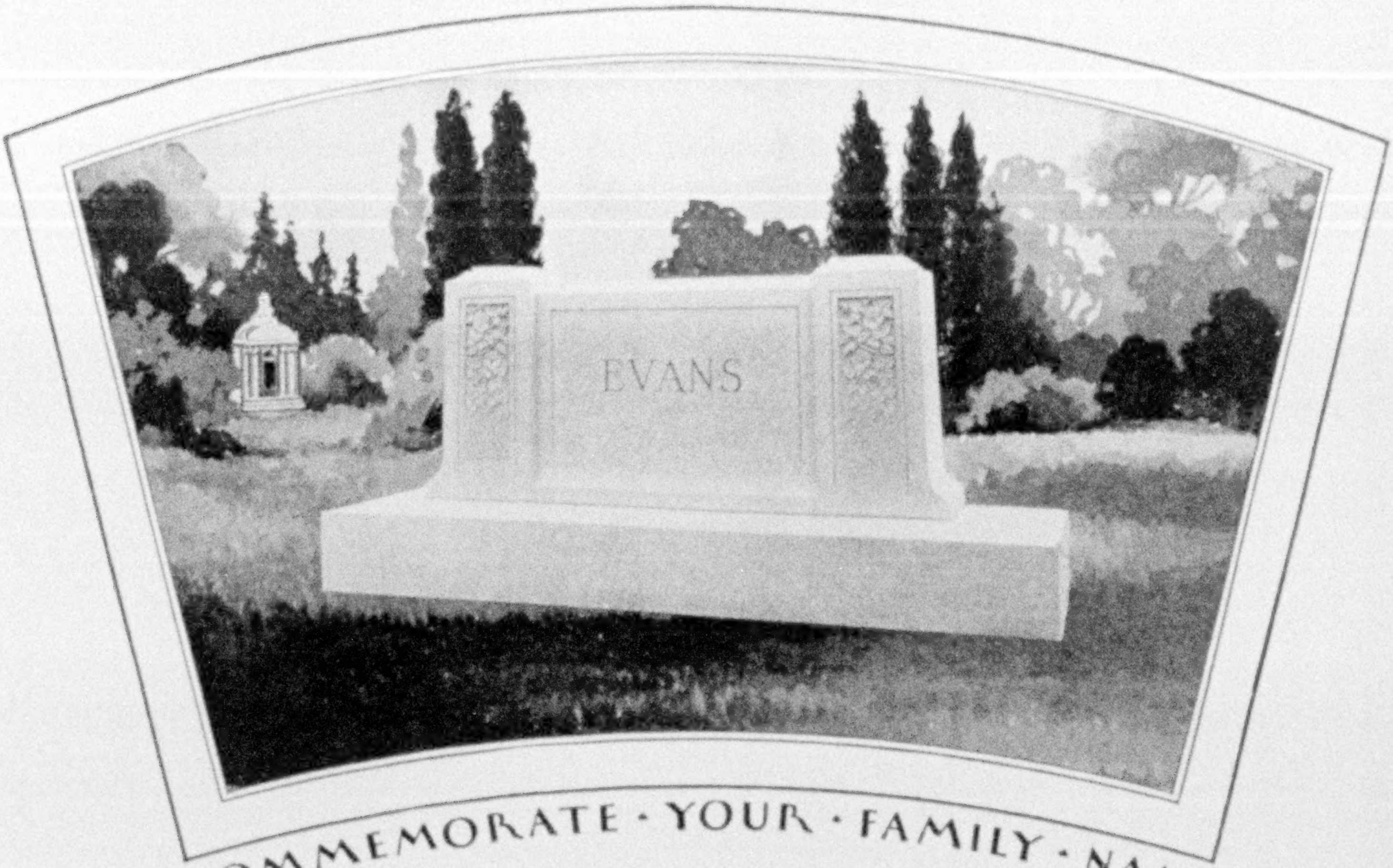

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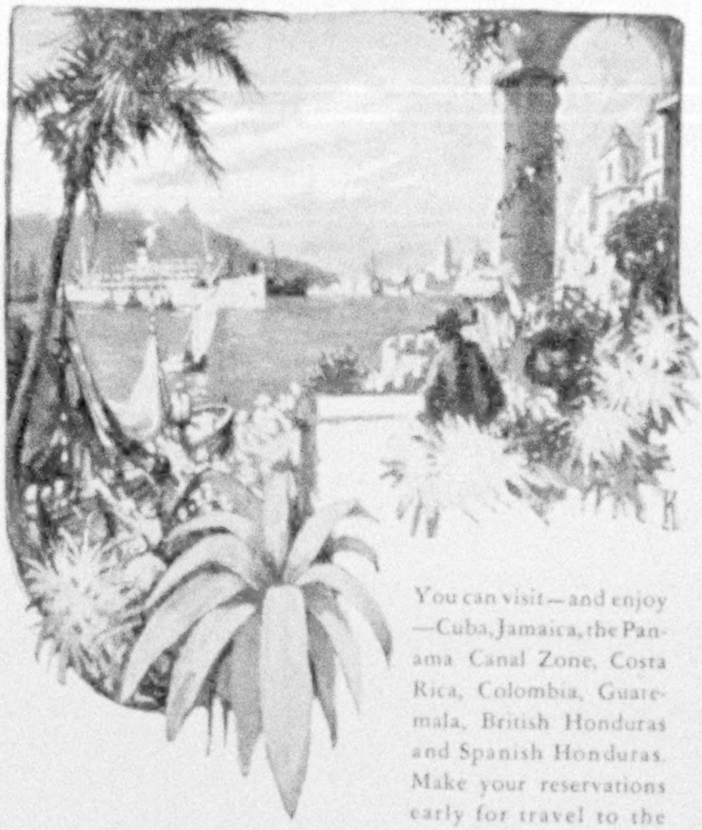

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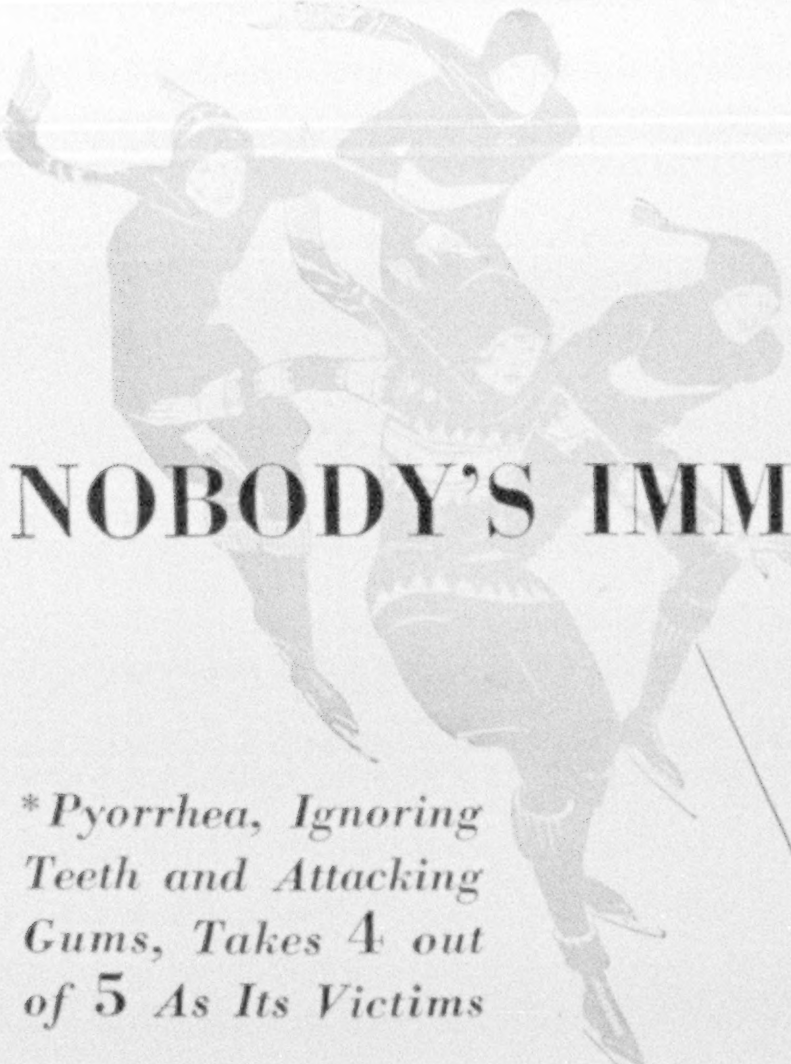
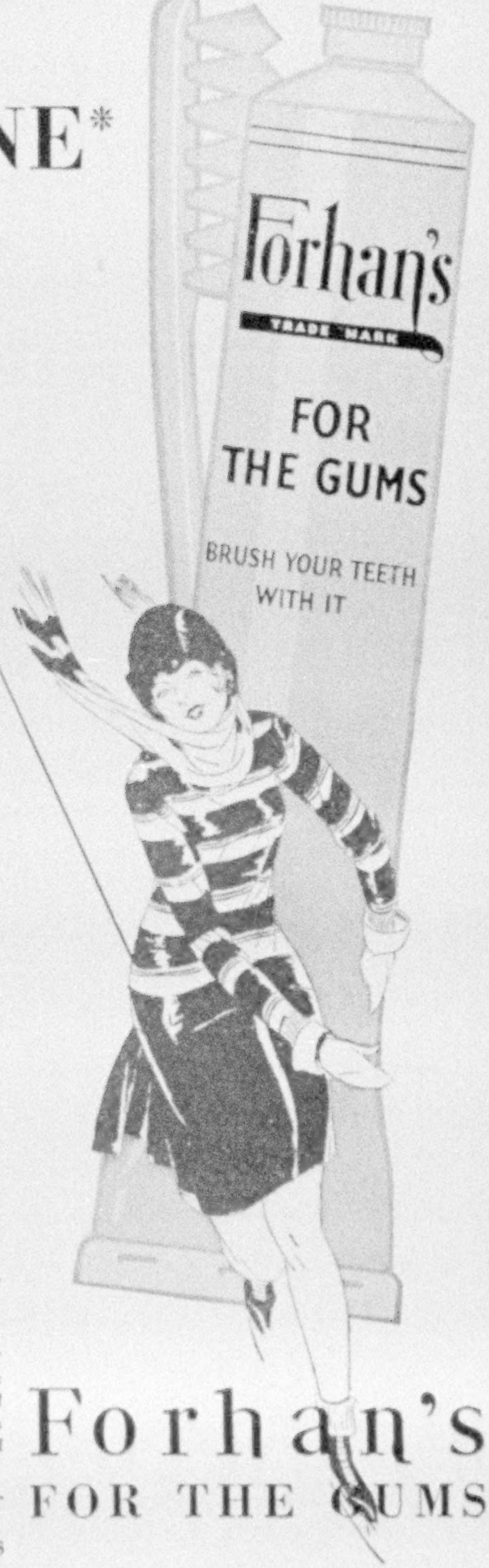
Though smiles reveal glistening teeth



NOBODY'S IMMUNE*



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EVERY time you brush your teeth, brush gums vigorously with the dentifrice made for the purpose—Forhan's for the Gums. For only proper care of the gums will preserve teeth and safeguard health against the attack of dread Pyorrhea.

Nobody's immune from this disease of neglect, which too often ravages health and beauty. And 4 persons out of 5 after forty and thousands younger pay heavy toll to this dread foe.

See your dentist at least once every six months, and start using Forhan's regularly, morning and night.

After using this dentifrice for a few days you will notice a distinct improvement in the health and appearance of your gums. They will be firmer, healthier and more youthful. As you know, Pyorrhea and other dread diseases seldom attack healthy gums.

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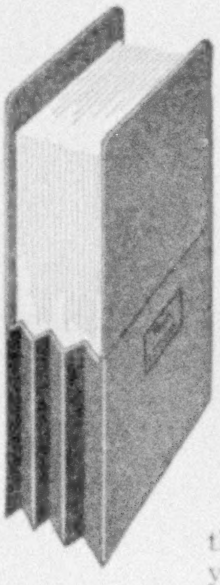

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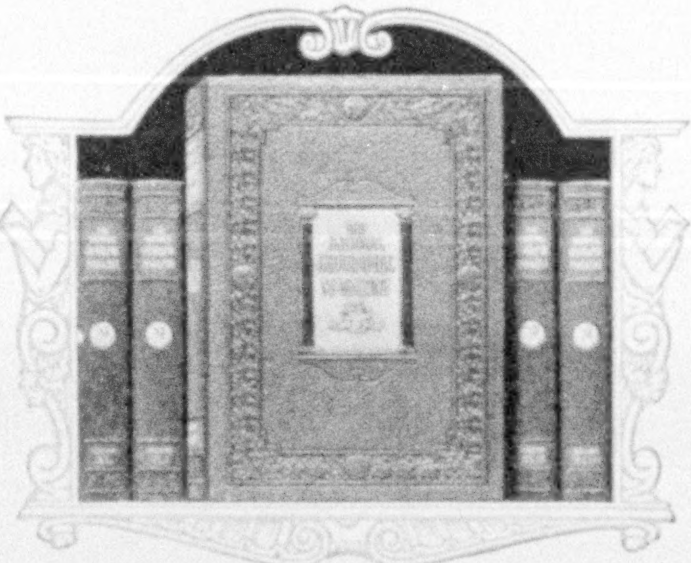

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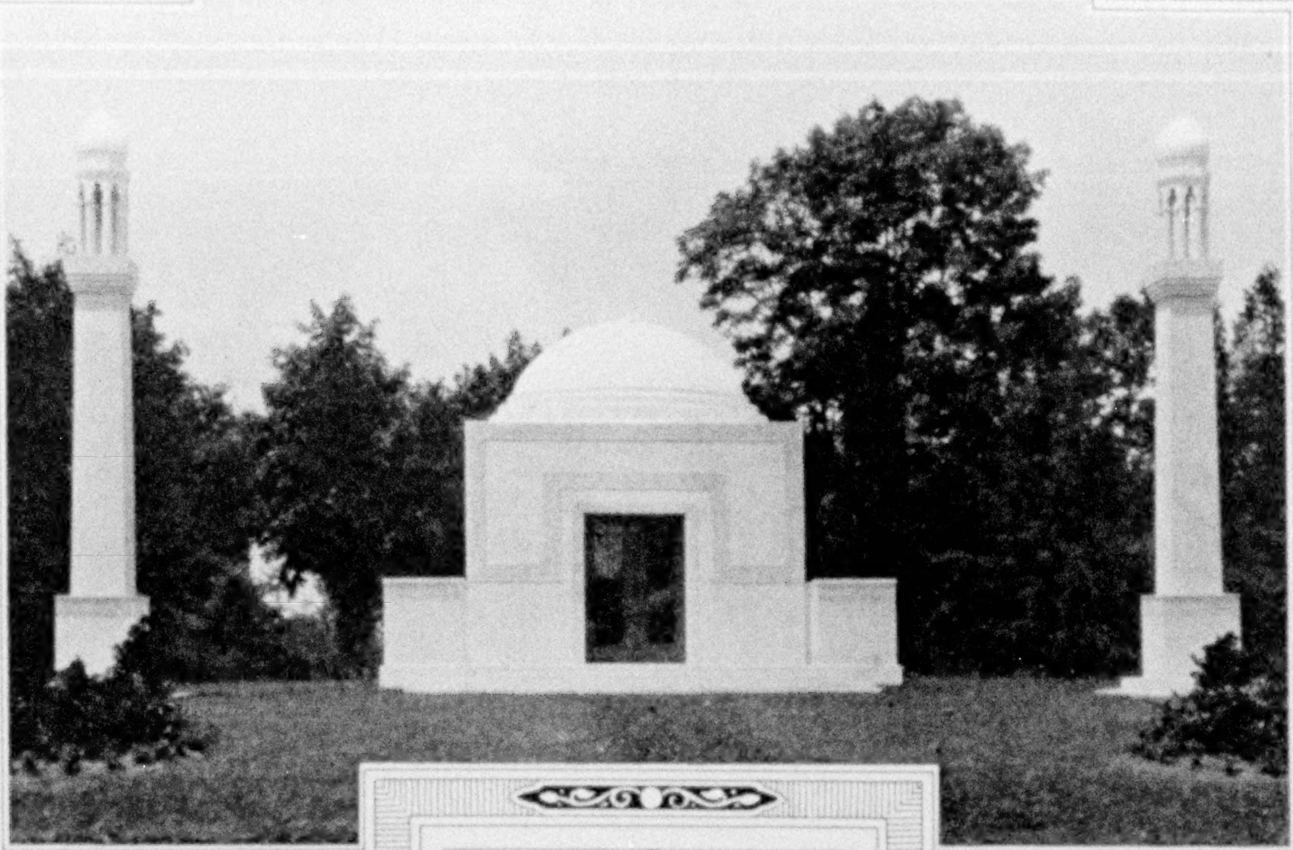

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Kensico Cemetery, New York

"-and lies down to pleasant dreams."

A mausoleum of Georgia Marble, that stone of exquisite beauty, is an ideal sepulcher for the rest eternal which comes to us all.

The beauty with which it may be used in memorial structures is vividly shown in the reproduction of the Edwards Mausoleum above. The classic lines of Moorish architecture are here accentuated and beautified by the luster of the marble.

Memorial architecture, whether Grecian, Romanesque, Gothic or modern, finds its best interpretation in Georgia Marble—a material which supplies the essentials of beauty, classic atmosphere and durability required for this form of construction.

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Above—Thommessen Mausoleum, of Milford Pink Granite, a beautiful structure in Pleasantville, New Jersey.

At right—Baxter Memorial, of all-polished Stony Creek Granite, located in Forest Lawn Cemetery, Buffalo, New York

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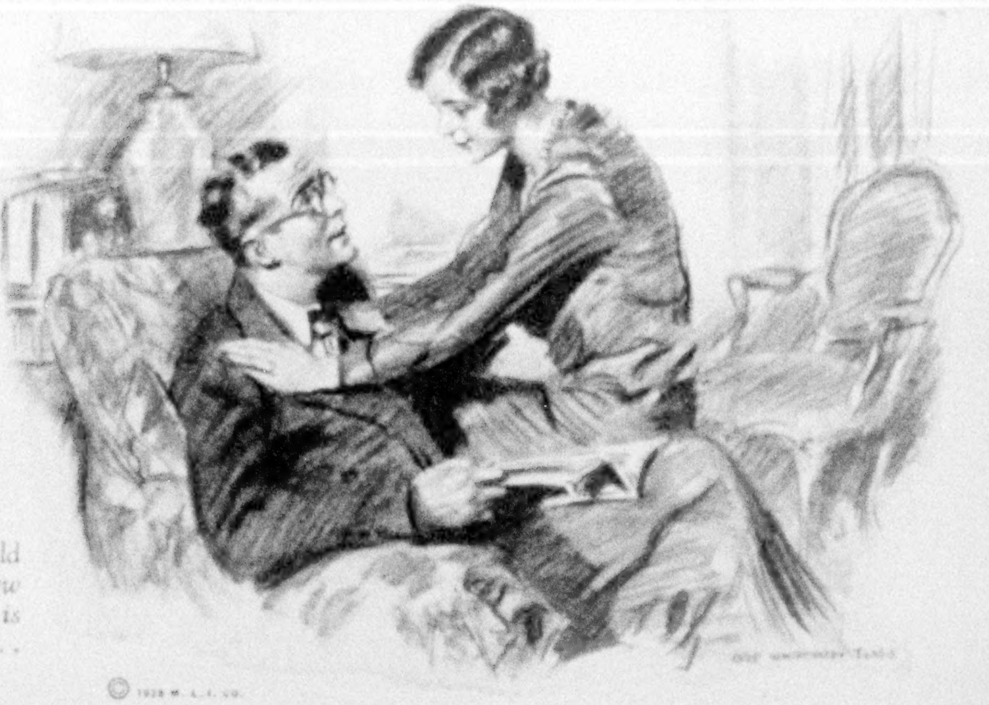

"Do you remember, you said you would give me anything I wanted for a New Year's present? Well, what I want is something for you as well as for me. . . . Is it a promise?"

© 1928 M. L. I. Co.

THERE is one thing that every wife who loves her husband wants above anything else—that he may have good health and a long life.

How many thousands of wives there are who are haunted by a secret fear that their husbands are not entirely well—who steal glances, when the other is off guard, in an effort to discover the cause of that constant dragging weariness, those too frequent headaches, those mysterious fleeting pains. Almost every woman knows that sharp thrust of anxiety to her heart, that catch in her throat when she thinks something is wrong with the man she loves. What is it? What can she do?

No longer must a doctor judge the physical condition of a man by his unaided senses alone. Now, by means of marvelous instruments, he can actually look inside the body, see the heart beat, the lungs contract and expand; watch the activities of the digestive tract; he can take x-ray photographs from head to foot.

The doctor who has kept step with the great discoveries in medicine can sometimes learn important things about the condition of the person he is examining, merely by testing the blood or taking the blood pressure. He can often trace the cause of pain in some remote part of the body to infection in a sinus or tonsil. Frequently ailments of years' standing have been traced to unsuspected infection at the roots of teeth.

Doctors today need not guess. They can detect trouble and in many cases check it before it has had time to damage the body greatly. Often their scientific examinations show the beginning of serious ailments of which the person examined had not the slightest suspicion.

Make sure that your dear one has a thorough health examination this month. And why not have one yourself? No better New Year present can be given.

THE LIGHT THAT NEVER FAILS

So new are the discoveries of medical science in relation to prolonging life that the majority of intelligent men and women have not heard about them. So amazing are some of these discoveries that they are difficult to believe. That seems to be the only explanation of the estimate that but one person in 500 has an annual health examination.

To determine the value of health examinations, a group of 6,000 policyholders of the Metropolitan Life Insurance Company were given physical examinations. These persons were advised to the extent they and their physicians deemed necessary on the proper way to conserve their health. In nine years the saving in mortality in this group was found to be 18 per cent.

The Metropolitan has recently prepared a booklet containing most important rules for gaining and keeping health. It gives much valuable information that tends to make life both long and happy. Send for booklet 19-N. It will be mailed without charge. HALEY FISKE, *President*,

METROPOLITAN LIFE INSURANCE COMPANY—NEW YORK

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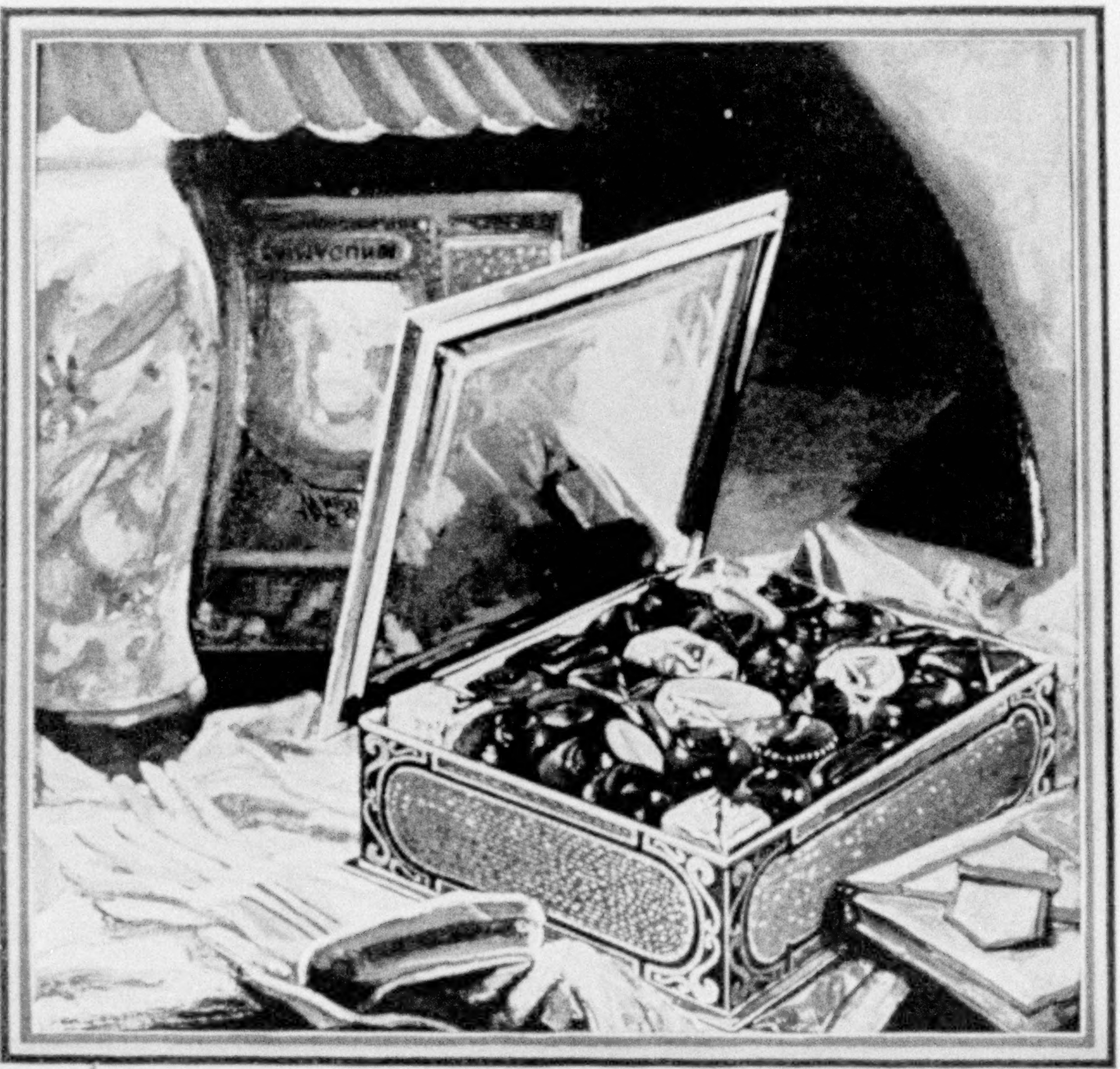

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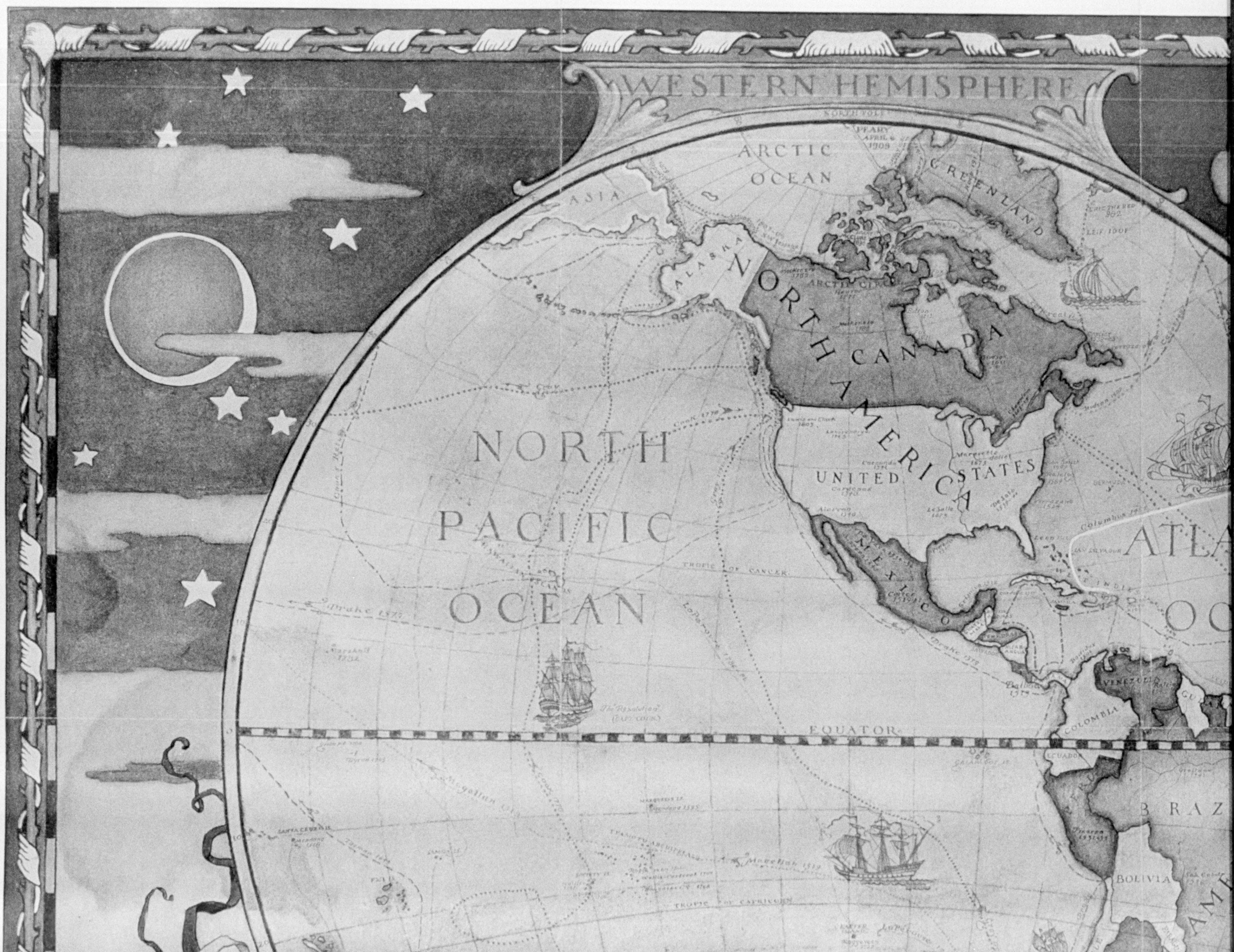
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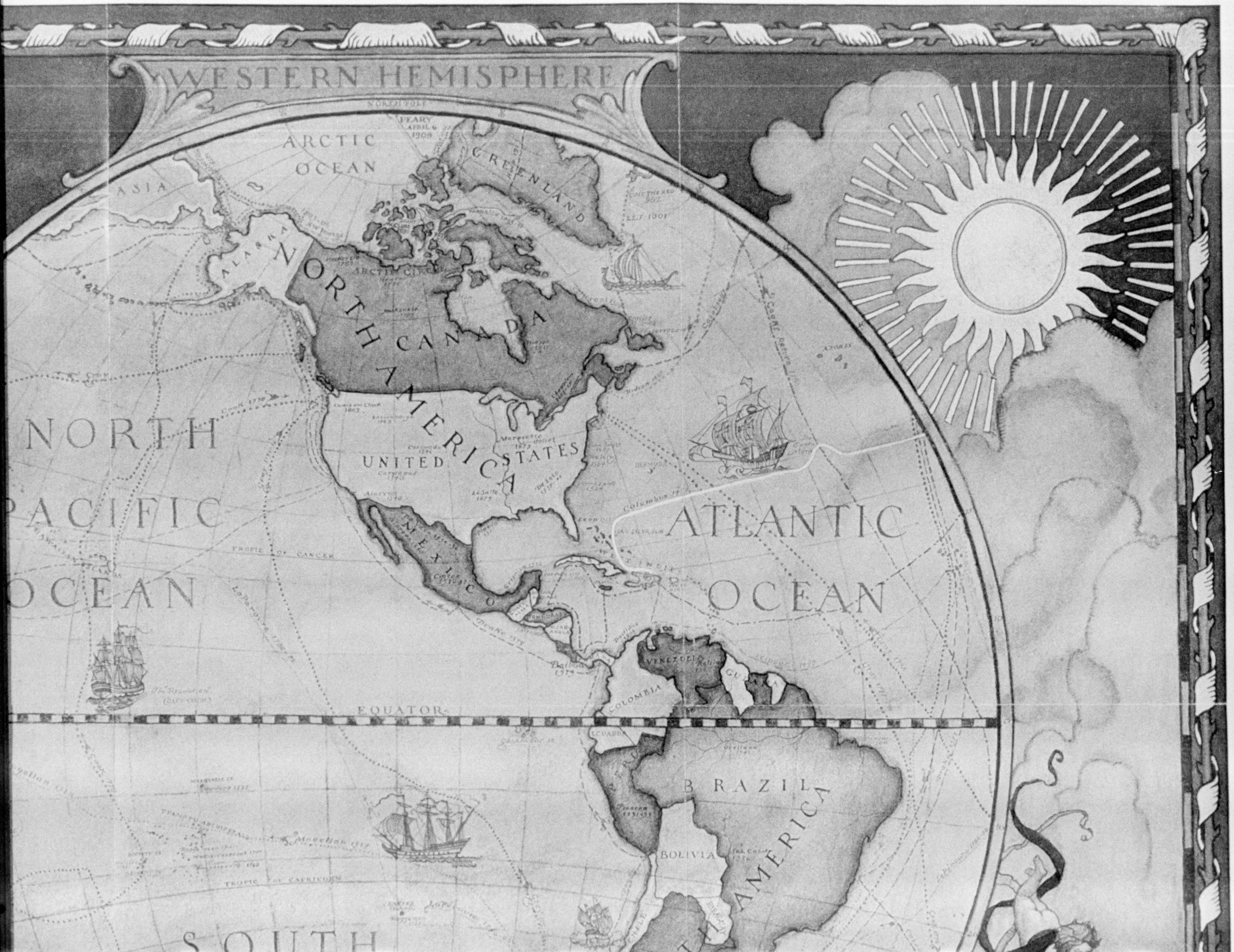
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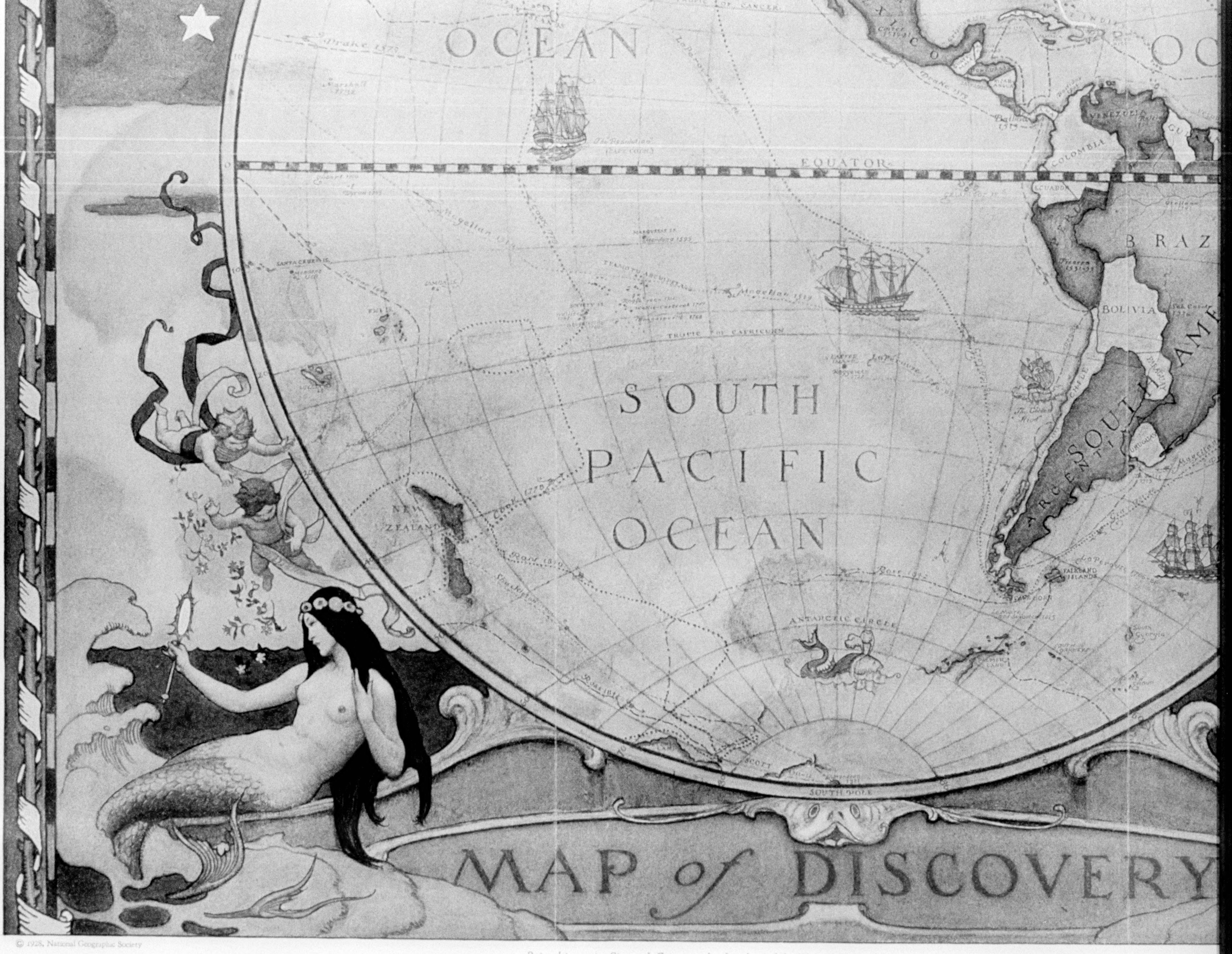
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MAP of DISCOVERY

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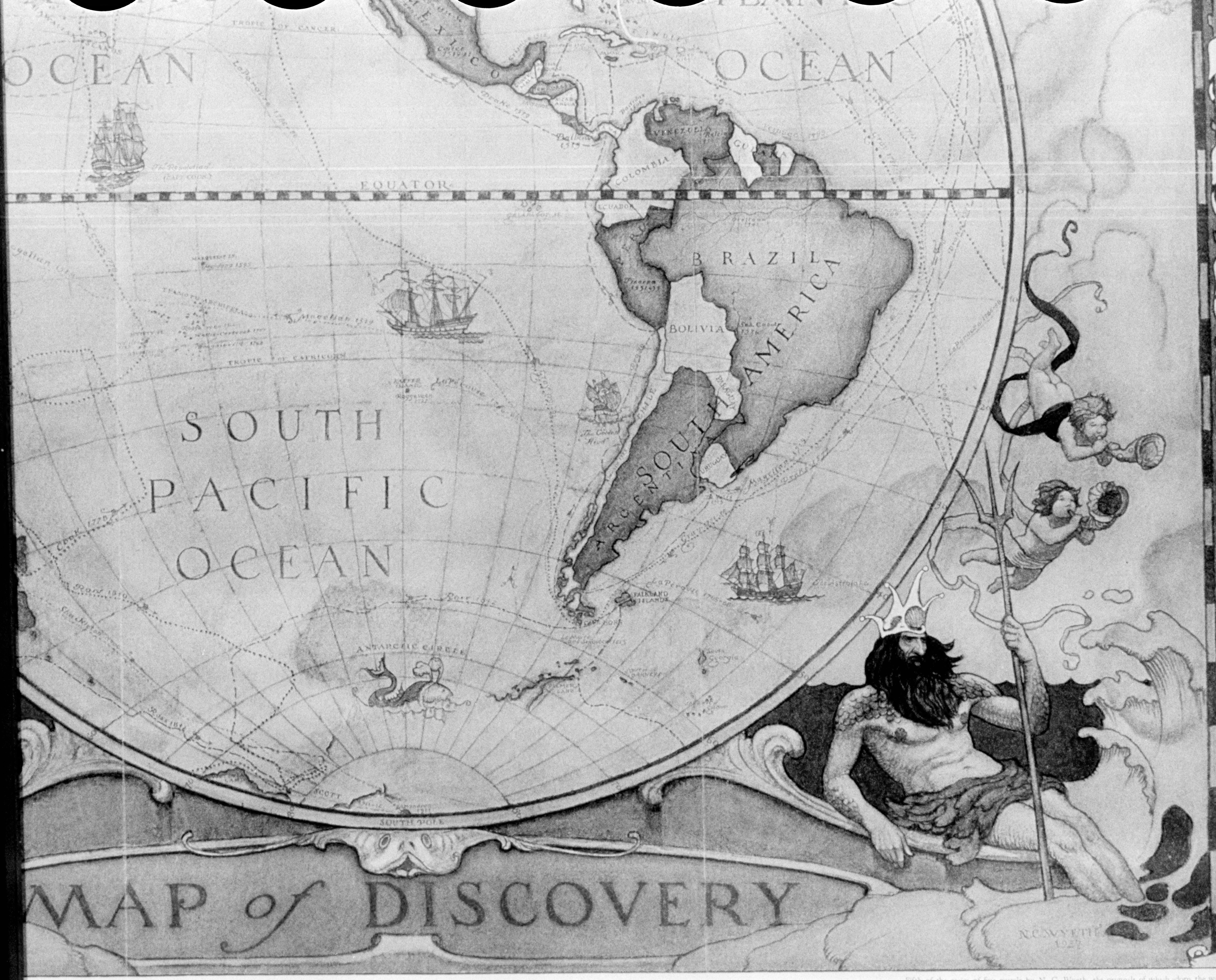
Painted in quaint Sixteenth Century style, this chart of the Western Hemisphere suggests the imagination that launched intrepid explorers to the ends of the earth, yet records accurately the boundaries of to-day. On it are traced the paths, plowed through virgin seas and blazed across unknown continents, that gave to man a realization of the true magnitude of his world.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MAP of DISCOVERY
N.C. WYETH
1927

Painted in quaint Sixteenth Century style, this chart of the Western Hemisphere suggests the imagination that launched intrepid explorers to the ends of the earth, yet records accurately the boundaries of to-day. On it are traced the paths, plowed through virgin seas and blazed across unknown continents, that gave to man a realization of the true magnitude of his world.

Fifth of the series of five murals by N. C. Wyeth, the originals of which adorn the walls of the National Geographic Society buildings in Washington. The other four pictures have appeared as frontispieces in the National Geographic Magazine for March, May, July and November, 1928.

Vol. LV, No. 1 WASHINGTON January, 1929

THE NATIONAL GEOGRAPHIC MAGAZINE

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ARIZONA COMES OF AGE

By Frederick Simpich

Author of "So Big Texas," "The Great Mississippi Flood of 1927," "Missouri, Mother of the West," "Along Our Side of the Mexican Border," etc., etc., in the National Geographic Magazine

CONSIDER Arizona. Airports now, and golf links, where yesterday bandits chased the bouncing stagecoach; symphony concerts and kindergarten chatter in place of wildcat wails and Indian warwhoops. No other State carved from the wilds grew so fast—from gunmen to grapefruit in a few short years.

A "Baby State," yes; but precocious—amazing in its swift transition. Not admitted into the Union until 1912, it has drawn from the cumulative experience of other States in politics, education, and industry. How fascinating to gauge its rapid rise from howling wilderness to civilization by other mileposts in American life!

Years after the Chicago fire Apaches still scalped settlers in Arizona. Philadelphia saw the Centennial close before a railway crossed the Yuma Desert, and Europeans by millions had migrated to our shores when Arizona boasted barely as many whites as New York now has policemen.

Dewey had sunk Montojo in Manila Bay and old Chief Geronimo was selling signed pictures of himself for ten cents each at the St. Louis World's Fair when Arizona had barely emerged from her long social pandemonium of road agents, goldseekers, and fugitives from Eastern justice.

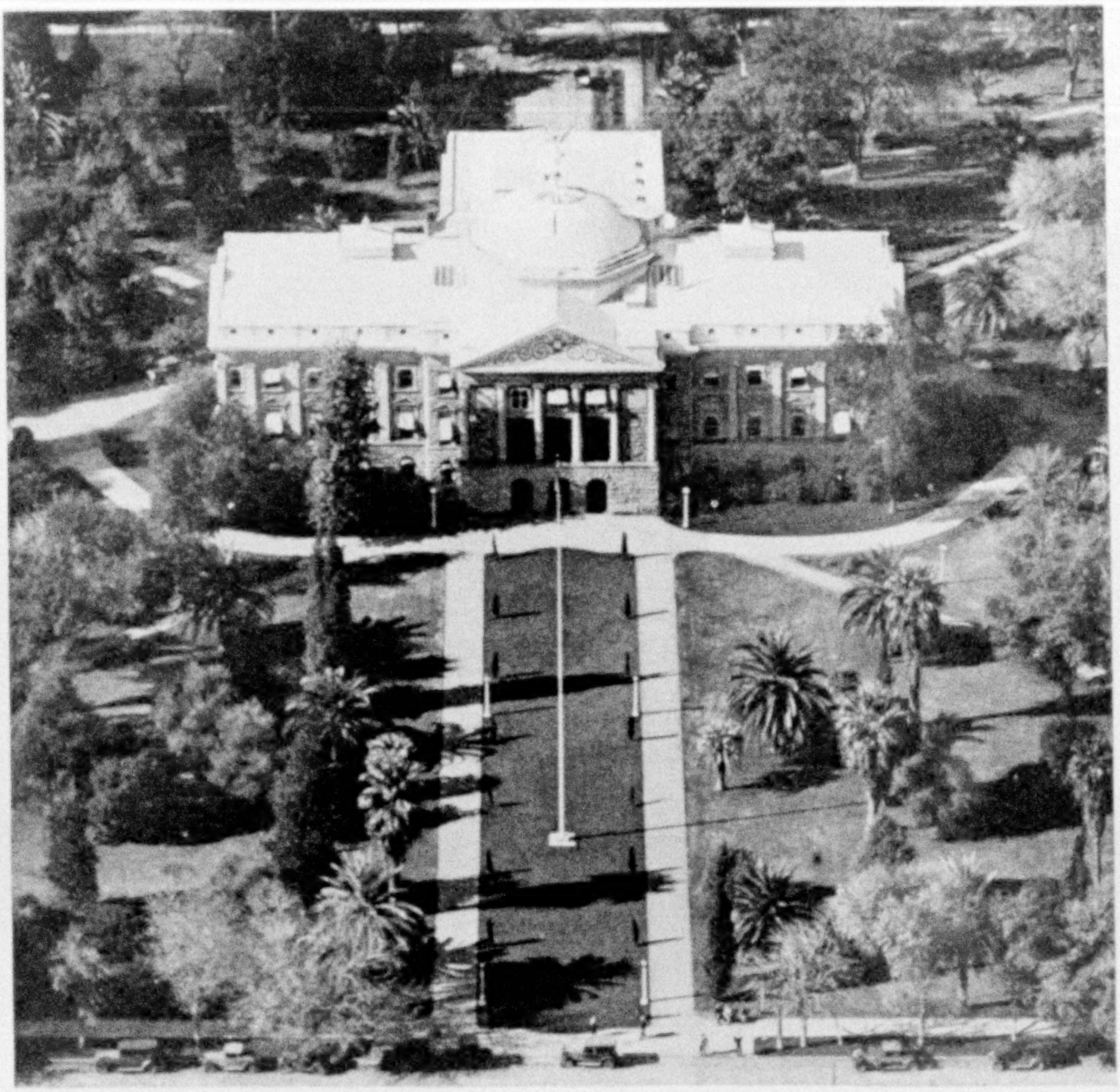
Yet Spaniards had settled here, bringing the first cattle seen on our continent, introducing new plants, and teaching Pimas and Hopis to be better farmers, before the first English settlements were made in our Eastern States. Tucson was old when Daniel Boone cut his name on a tree in Tennessee where he had killed a bear. In awe Cárdenas, of Coronado's Expedition, lifted up the Cross at the Grand Canyon scarcely 50 years after Columbus reached America.

Across Arizona Kearny led his army to California and Forty-niners fought their hard, hot way. Kit Carson battled here and Lieut. E. F. Beale made his famous experiment with imported camels as pack-trains in the Southwest—until infuriated prospectors shot the camels because they stampeded their burros. But killer Indians, the difficulty of hauling in goods, and preference for California kept colonization down. As late as 1860, all the whites in Arizona probably numbered less than 5,000.

Then Civil War. From it Arizona received a further setback that lasted until railways finally came, hauling in mining machinery, and judges, law books, and locks for jail doors. Thus, after years of neglect, the Nation that owned the territory gave it law and order.

WEALTH AND POPULATION INCREASE MANY FOLD IN 30 YEARS

Arizona's white population, not including Mexicans, has increased by 600 per cent since the Spanish-American War and its wealth has multiplied maybe twenty times. Lonely cow trails are changed to



© Rinehart-Whelan Company

AN AËRIAL VIEW OF THE ARIZONA STATE CAPITOL AT PHŒNIX

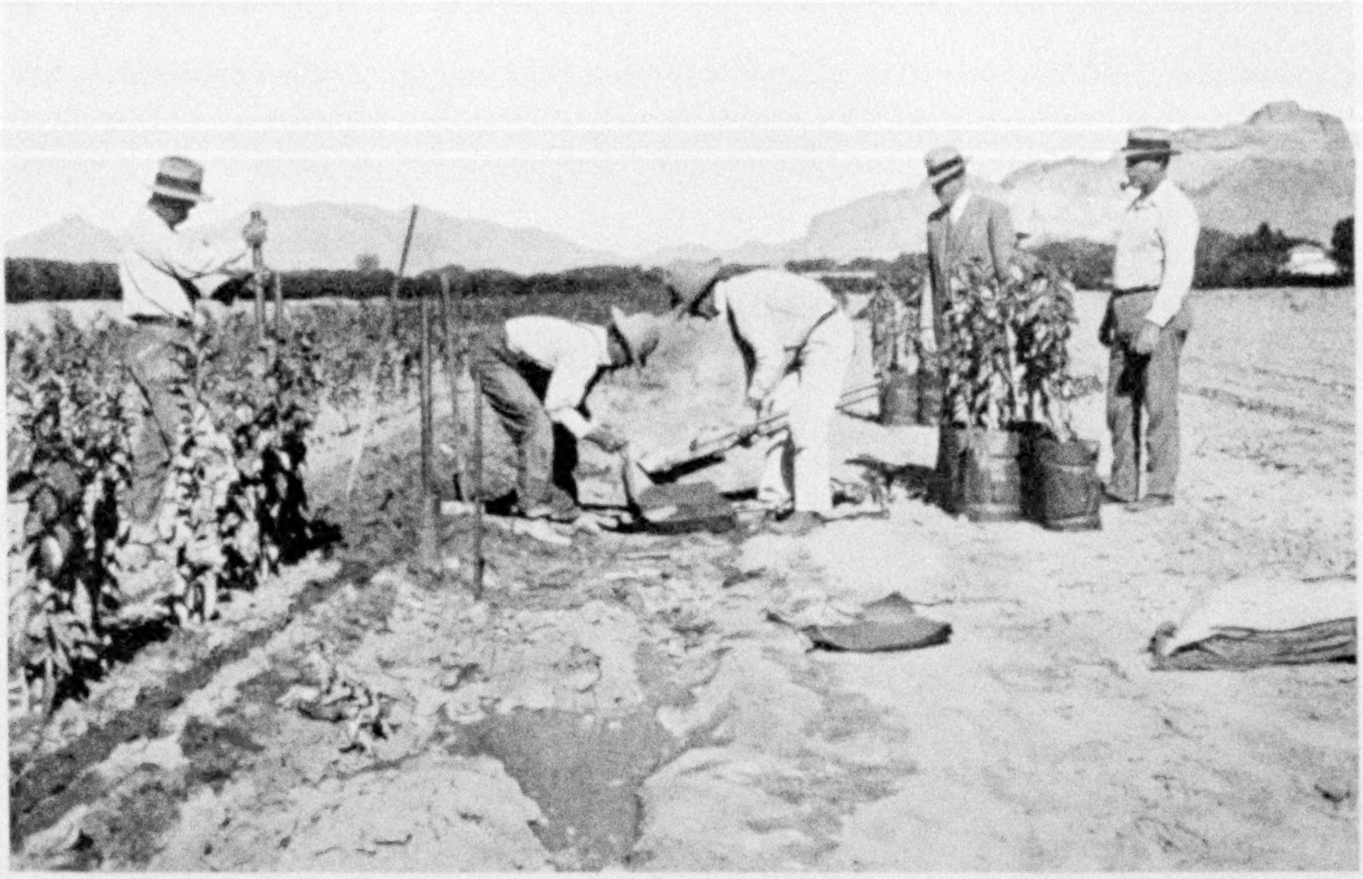
Many a hard-fought legislative battle is staged here, as the new State struggles with the problems of power and irrigation, school taxes, highways, and bond issues. The political situation is further complicated by the fact that so many of the commonwealth's industries are owned by absentees, and that a confusion of tongues is hers—from Indian tribes and Mexicans. Palms lend a tropical aspect to the capitol grounds in Arizona's progressive metropolis (see, also, text, page 28).

crowded motor lanes, and million-dollar hotels flaunt their splendor where 'dobe huts and desert skies were long man's only shelter.

Now, to see modern Arizona whole, look hastily at its map spot and at high lights in its astounding past.

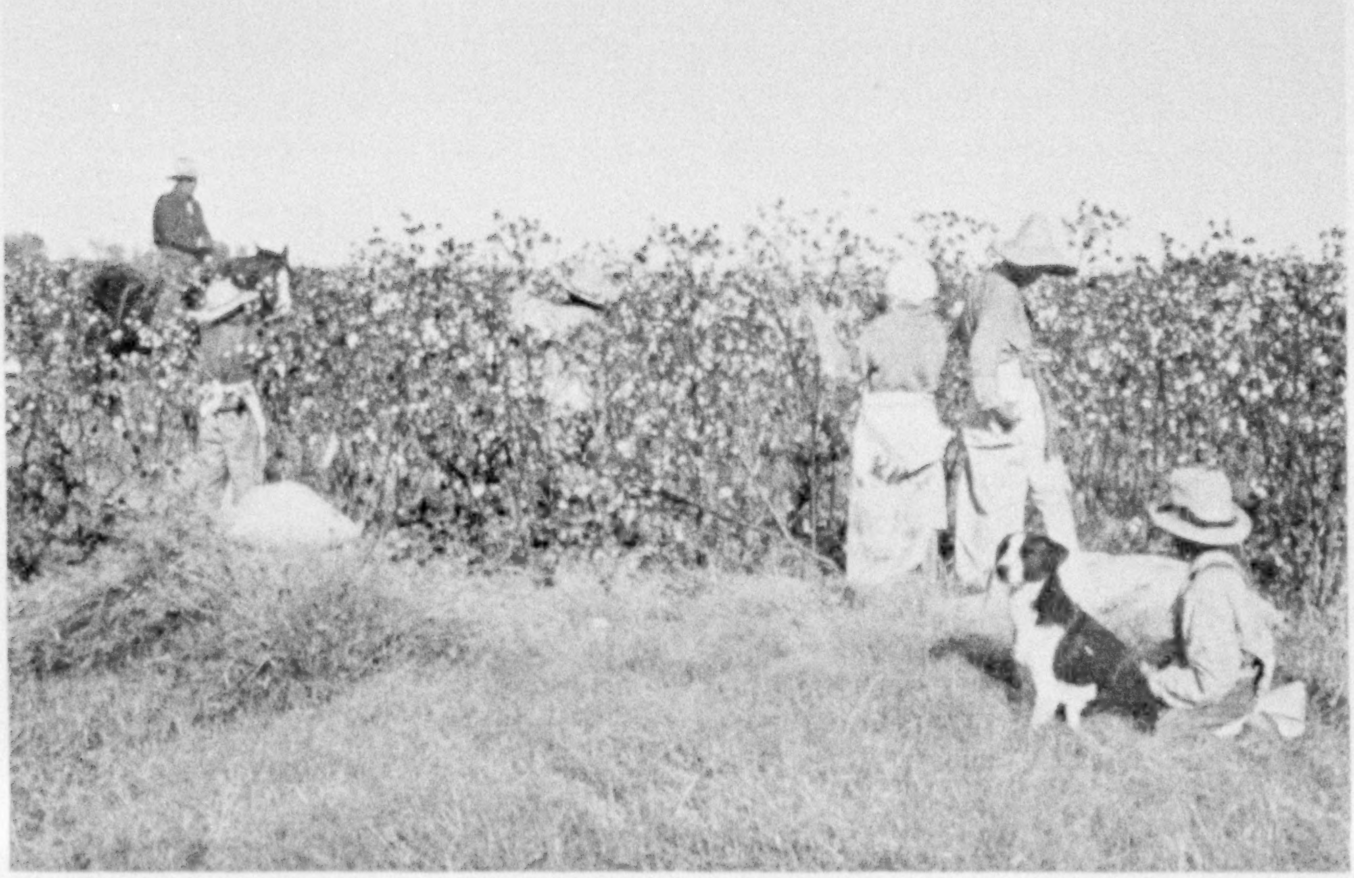
Under the Treaty of Guadalupe Hidalgo in 1848, the United States acquired land only as far south as the Gila River; by the Gadsden Purchase, in 1854, it received the rest of that *terra incognita* later called Arizona Territory.

A few studious Americans, delving in early Spanish chronicles, learned that explorers like Cabeza de Vaca and Coronado, and early missionaries like Father Kino had found here "rivers with banks three leagues high" and mines rich enough to yield a silver nugget so heavy that two mules were lashed together to carry it! From beaver trappers, too, who had ventured down the Colorado, tales of Arizona's scenic wonders, and especially of its warlike Apaches, had been brought back. But to most Americans practically nothing



CITRUS CULTURE IS AN IMPORTANT FACTOR IN ARIZONA'S HORTICULTURAL GROWTH

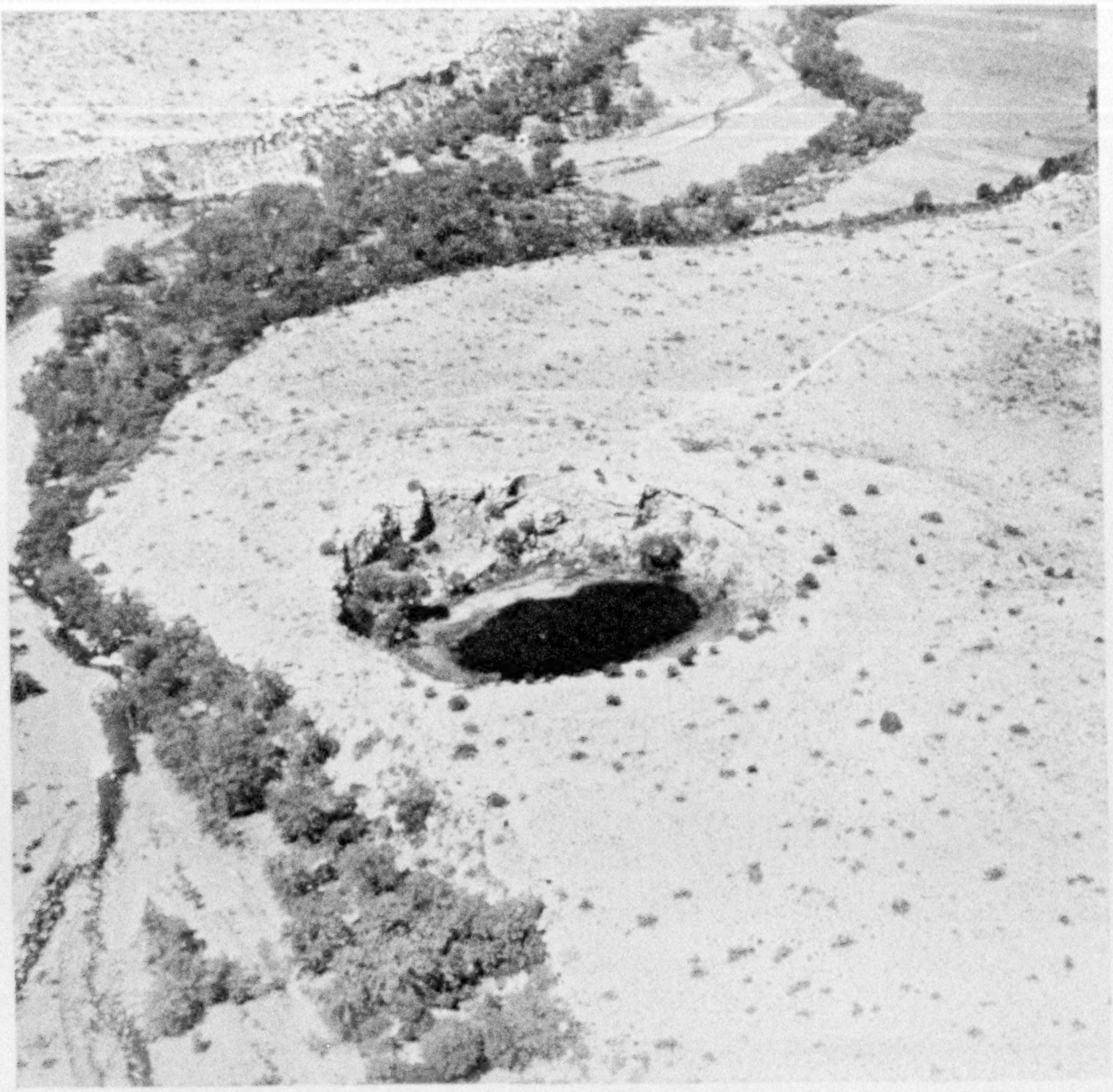
Small trees, too young to be left outdoors in winter, are taken up by a "balling machine," which holds a ball of earth about the roots, and temporarily planted under shelter. In spring they are set out again. "Balling" grapefruit and orange trees in a Salt River Valley grove near Phœnix.



Photographs by Clifton Adams

FROM THE DELTA OF THE NILE CAME ARIZONA'S LONG-STAPLE COTTON

The staple of this Pima cotton averages 1⅝ inches and is much used in automobile tire manufacture. It was developed from Mit Afifi cotton, brought from Egypt by the U. S. Department of Agriculture about 1900. Mexican pickers, near Litchfield Park, Arizona.



© Everett D. Newcomer

MONTEZUMA WELL, A GREAT RAGGED HOLE DRILLED IN ARIZONA AS IF BY GIANT GUNFIRE FROM ANOTHER WORLD

This natural tank occupies the center of a low mesa about nine miles north of old Camp Verde. Water stands in it, at practically the same level, the year around. Ruins of cliff-dwellers' homes cling to the sides of its steep bowl, which was once used, no doubt, by the same tribe that built Montezuma Castle, a great ruined edifice on Beaver Creek, a few miles away. By some pioneer prank of nomenclature, both the Castle and the Well were named for the Aztec ruler.

was known of Arizona; it was too hard of access.

One early delegate to Congress reached Washington by way of Panama and is said to have collected $7,000 in mileage! This same delegate, years later, set up a sun-worship cult in Arizona.

To give Arizona a seaport, Mr. Gadsden's own plan was to take in part of Sonora, down to Guaymas. This would have provided a port on the Gulf of California, which might have shifted the whole economic and immigration history of Arizona and probably of northwest Mexico, too. But this plan was not approved; Uncle Sam found himself with a remote, unexplored savage land, hard to reach. So, instead of our "American Egypt" having a seaport on its border, it remains a landlocked region of long rail hauls.

INACCESSIBILITY AND SAVAGES RETARDED THE STATE

This inaccessibility, the character of the country itself, and its savage inhabitants kept Arizona for decades the most backward of all our territories.

Buying Arizona was folly, Eastern peo-

Photograph by Clifton Adams

IN ITS SHADOWS HAVE RESTED TIRED MEN OF MANY FAITHS

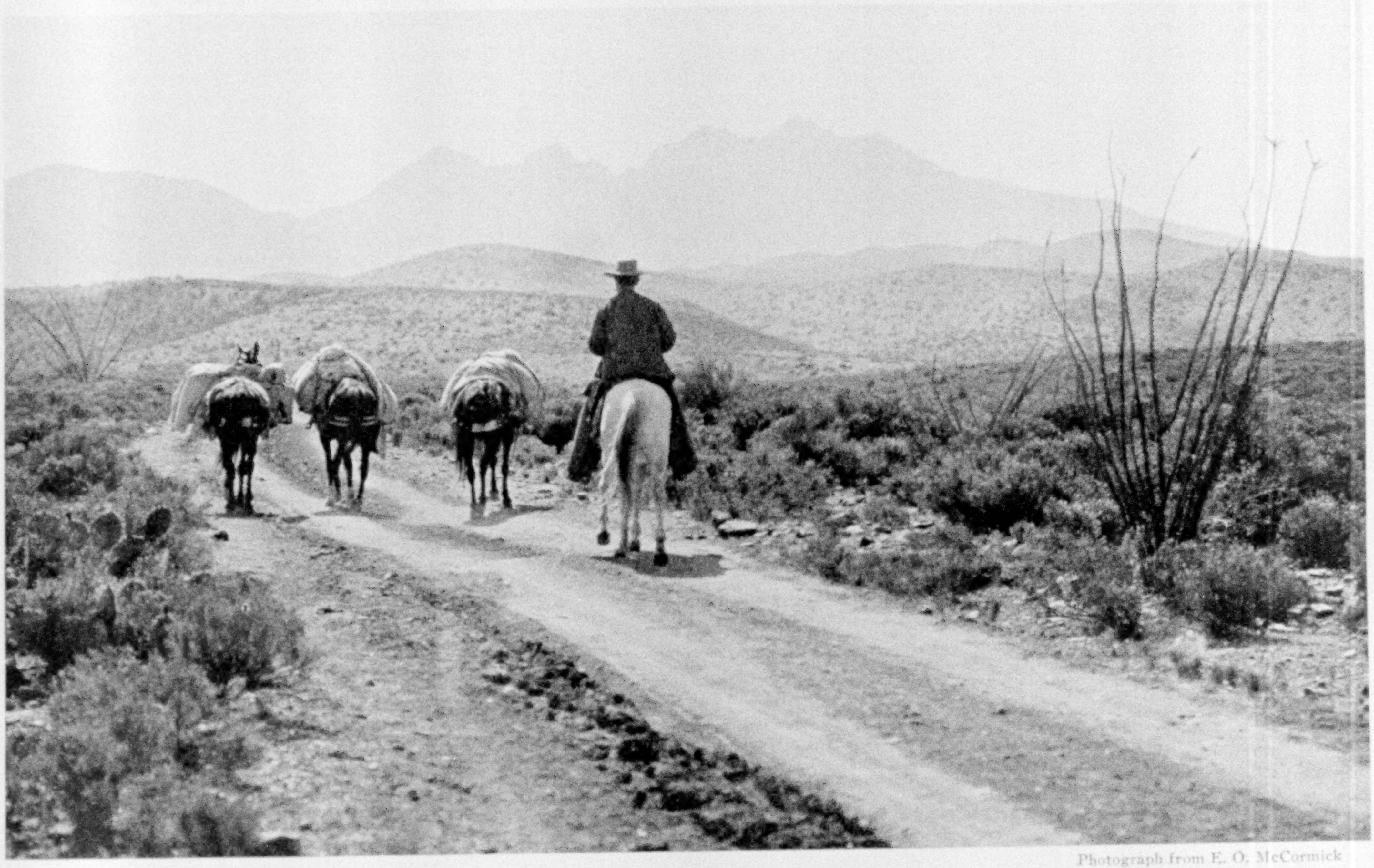
Spaniards, Yankee trappers, Indian scouts, Forty-niners, soldiers of the Civil War, and tourists of to-day—all have passed this way and heard the vesper bells of this ancient mission of San Xavier del Bac. Founded about 1700, by Fathers Kino and Salvatierra, on what is now the Papago Indian Reservation, near Tucson, it is one of the most beautiful examples of early Spanish church building in the Southwest.

ple said; its arid wastes were useless. Yet surveys began to show that, for all its evil deserts, it had big rich spots of much value; also, now that it belonged to us, we were free to make roads across it, to tie up Texas with southern California.

Yet for 20 years after the Gadsden Purchase Arizona communicated with the outside world largely by water. Ships ran from San Francisco to the mouth of the Colorado River, via the Mexican ports of Mazatlán, La Paz, and Guaymas.

A semimonthly mail and passenger stage line was started in 1857 from San Antonio to San Diego; but at times it cost the Government $65 to carry each letter! A year later the historic Butterfield stages began running between St. Louis and San Francisco. An early writer says: "This was one of the grand achievements of the age, to span the continent by a semiweekly line of stages, under bonds to perform, by sole power of horseflesh, a trip of nearly 2,500 miles within the schedule of 25 days."

It was the trek of people from the South to the West after the Civil War that began to give Arizona population. Previous to that, white men saw little of it, except



Photograph from E. O. McCormick

REMOTE FROM THE WATERED VALLEYS AND MAIN HIGHWAYS OF ARIZONA ARE MANY THINLY PEOPLED REGIONS OF MEANDERING TRAILS

Cowmen, miners, hunters, or lumbermen riding these wild lands of hidden water use hilltops and other landmarks as signposts on the march. In the old Apache country around Salt River Valley, the Four Peaks, seen in the background, have long served as guides to red and white wayfaring men.

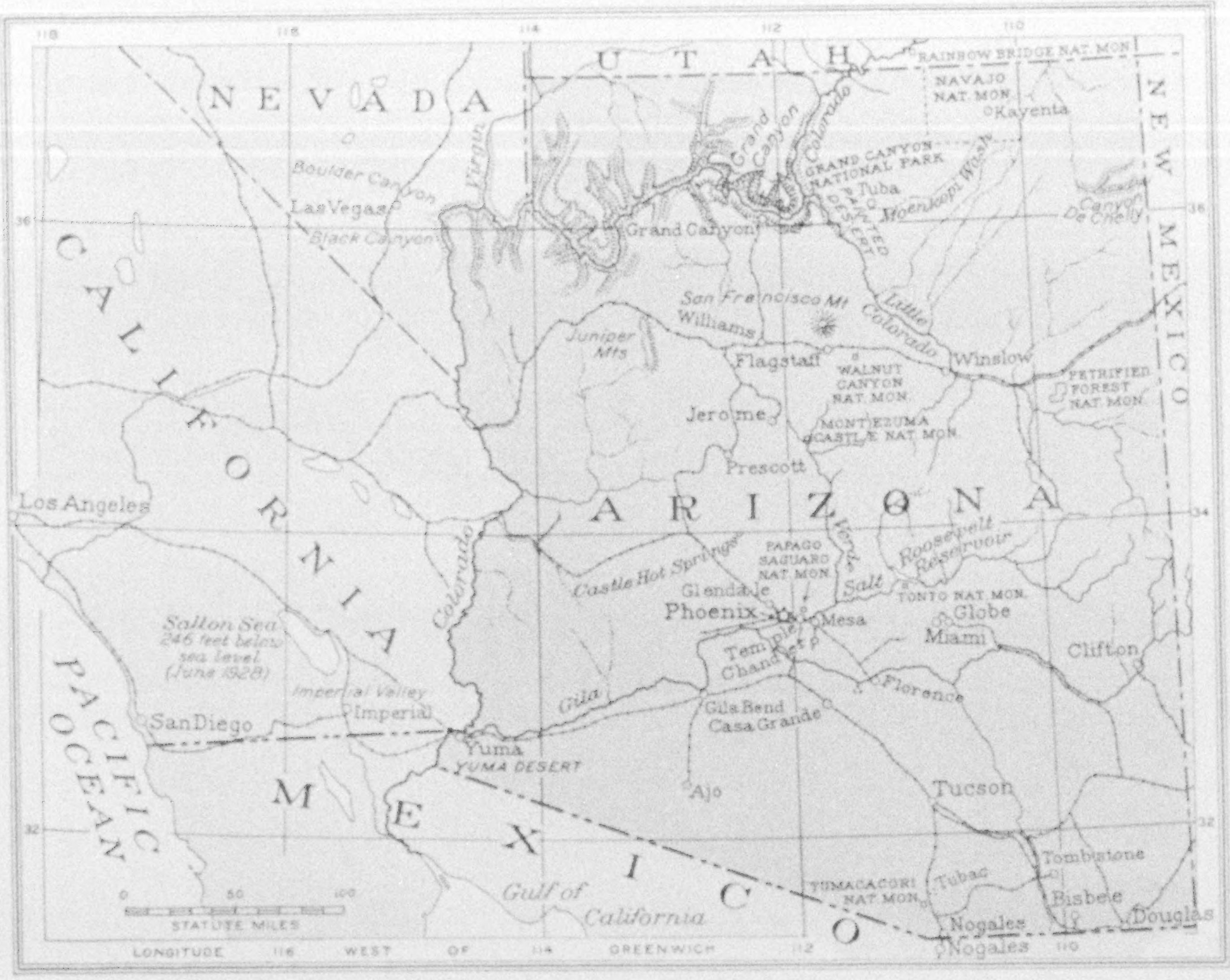
MOUNTAIN PASTURES IN SUMMER, WITH VALLEY ALFALFA FIELDS IN WINTER, MAKE AN IDEAL SHEEP COUNTRY

Among the national forests and high plateaus of north Arizona, grazing for sheep is excellent in the warmer months. Before snowfall great herds are driven to the lowlands. If grazing along the march is poor, flocks are shipped by train. A herd wintering near Chandler, with the tent of the Mexican sheepherder in the middle distance.

Photographs by Clifton Adams

IN OLDEN DAYS FARM TURKEYS FORAGED FOR A LIVING

To-day successful turkey raisers fatten their birds as swine and beeves are fed. Here is part of a flock of 500 being fed on grain, near Litchfield Park, Arizona. One farmer near Phœnix turns his turkeys into an olive grove, and they fatten on ripe olives from the trees.


NEVADA
UTAH
NEW MEXICO
CALIFORNIA
ARIZONA
MEXICO
PACIFIC OCEAN
RAINBOW BRIDGE NAT. MON.
NAVAJO NAT. MON.
Kayenta
Grand Canyon
Colorado
GRAND CANYON NATIONAL PARK
Tuba
PAINTED DESERT
Moenkopi Wash
Canyon De Chelly
Boulder Canyon
Las Vegas
Black Canyon
Virgin
Grand Canyon
San Francisco Mt
Williams
Juniper Mts
Flagstaff
Little Colorado
Winslow
WALNUT CANYON NAT. MON.
PETRIFIED FOREST NAT. MON.
Jerome
MONTEZUMA CASTLE NAT. MON.
Prescott
Los Angeles
Verde
Roosevelt Reservoir
Castle Hot Springs
PAPAGO SAGUARO NAT. MON.
Glendale
Phoenix
Mesa
Salt
TONTO NAT. MON.
Globe
Miami
Clifton
Tempe
Chandler
Florence
Salton Sea 246 feet below sea level (June 1928)
Imperial Valley
Imperial
Colorado
Gila
Gila Bend
Casa Grande
San Diego
Yuma
YUMA DESERT
Ajo
Tucson
Tombstone
TUMACACORI NAT. MON.
Tubac
Bisbee
Douglas
Nogales
Nogales
Gulf of California
0 50 100
STATUTE MILES
LONGITUDE 116 WEST OF 114 GREENWICH 112 110
118 116 114 112 110
36
34
32

Drawn by A. H. Bumstead

THE MAP OF ARIZONA REVEALS THAT MUCH OF THE STATE IS MORE THAN ONE MILE ABOVE SEA LEVEL

Covering close to 114,000 square miles, Arizona is fifth in size among the States, but only 44th in population. Vast irrigation and power projects on the Colorado River are contemplated, with opinions differing as to the feasibility of constructing a mammoth dam at Boulder Canyon or Black Canyon. A board of engineers and geologists has recommended the latter site to the Congress now in session.

the regions about Tucson, the Gila Bend, and Yuma, which lay along the Forty-niners' trails.

To-day passengers on fast trains through Arizona complain if the shower in the club car is not cool, or if the barber's razor is dull. Getting "laid out" for two hours at a place like Tubac, with a broken engine, is called hardship.

But look out of the window.

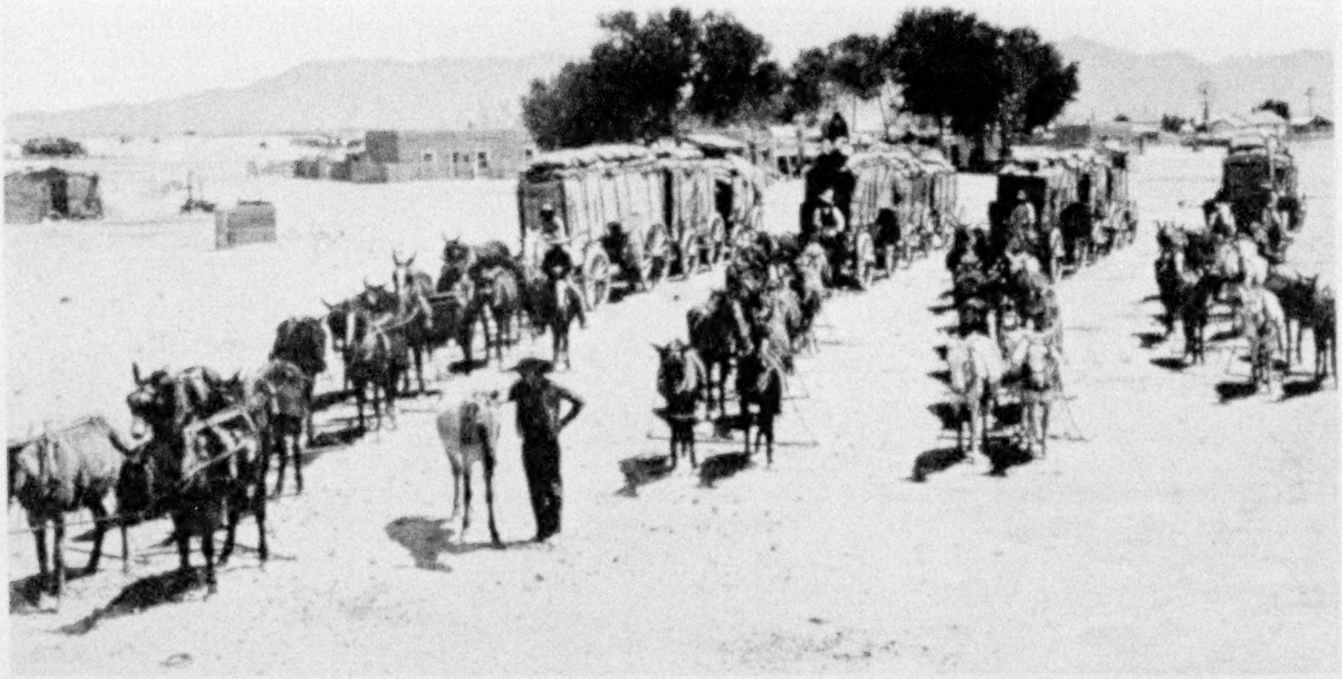
Those brush-grown mounds are graves of Apache victims. The sufferings of such pioneers from heat, hunger, and thirst, from Apache torture, were almost without parallel in the history of human enterprise. Here, near Tubac, an aged freighter told me Apaches jumped his wagon train. He shot his way to brush. Hiding there, his partner dead, he watched redskins burn his wagons, drive off his mules, and carry away his grub and blankets.

Few early Arizona whites died natural deaths. This was the cost of conquest. Army survey parties, Indian scouts, trappers, prospectors, and traders came, explored, and left their bones to bleach; but they conquered. In time they made Arizona safe—safe for club cars with barbers on board, for men in shower baths, and for autobus rides over the Apache Trail.

COPPER AND GOLD BRING PROSPERITY

Arizona really began to grow up with the development of her mines by Americans.

Quest for gold first brought white men here. Legendary gold-roofed temples of Cibola lured Coronado. He didn't find a



Photograph by Bate

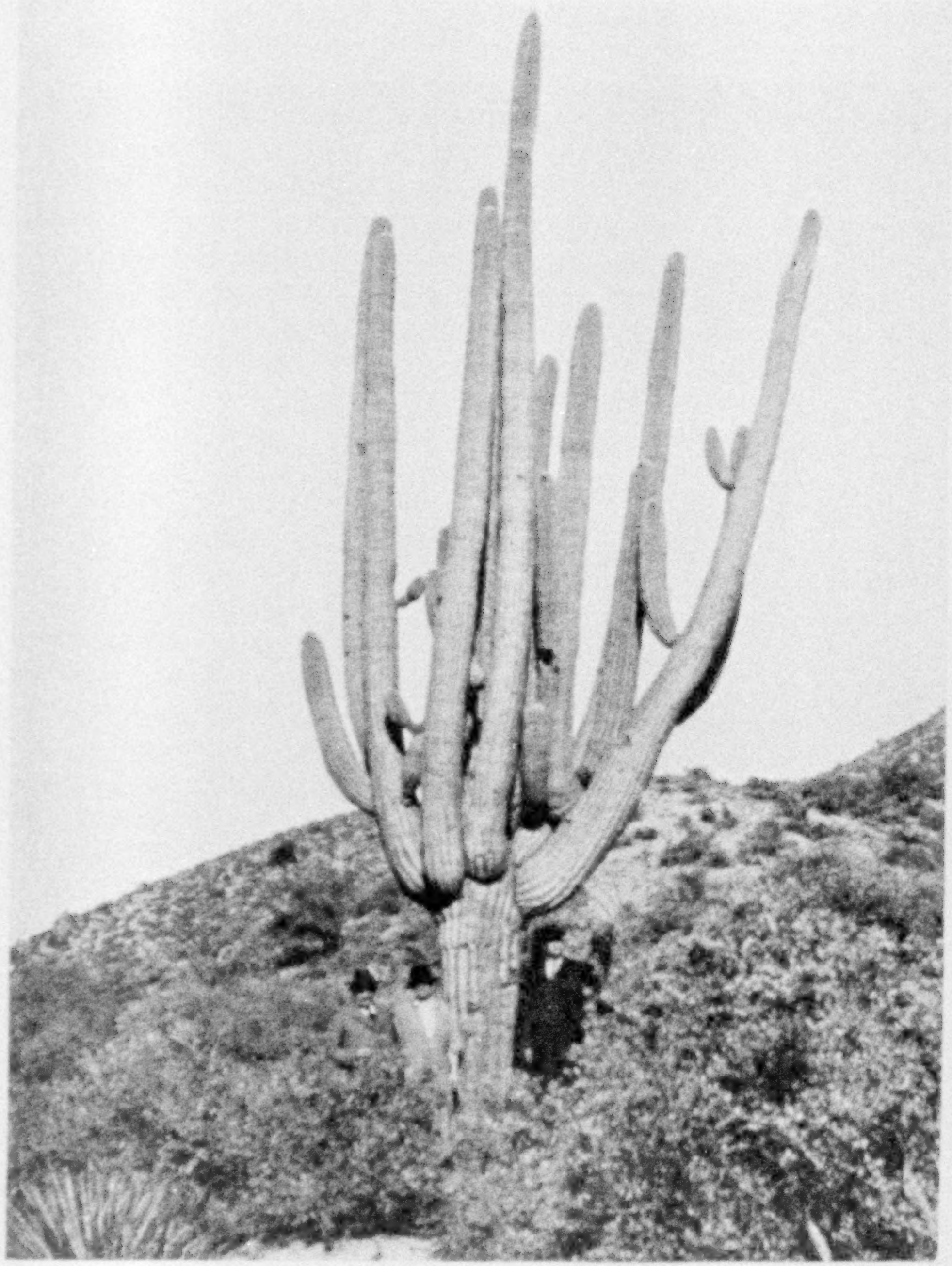
WHEN LONG WHIPS, STRONG ARMS, AND SCORCHING VOCABULARIES WERE NEEDED

Such creaky wagons, lashed two and three in a row and drawn by ten to twelve mules or horses, moved Arizona's ore and freight before railroads came.

Photograph by Clifton Adams

ONE OF AMERICA'S LARGEST PINE BELTS LIES IN NORTH ARIZONA

Here fire protection, regrowth, and selective cutting, under Uncle Sam's alert eye, tend to preserve a steady, permanent supply of lumber.



Photograph by Dr. Gilbert Grosvenor

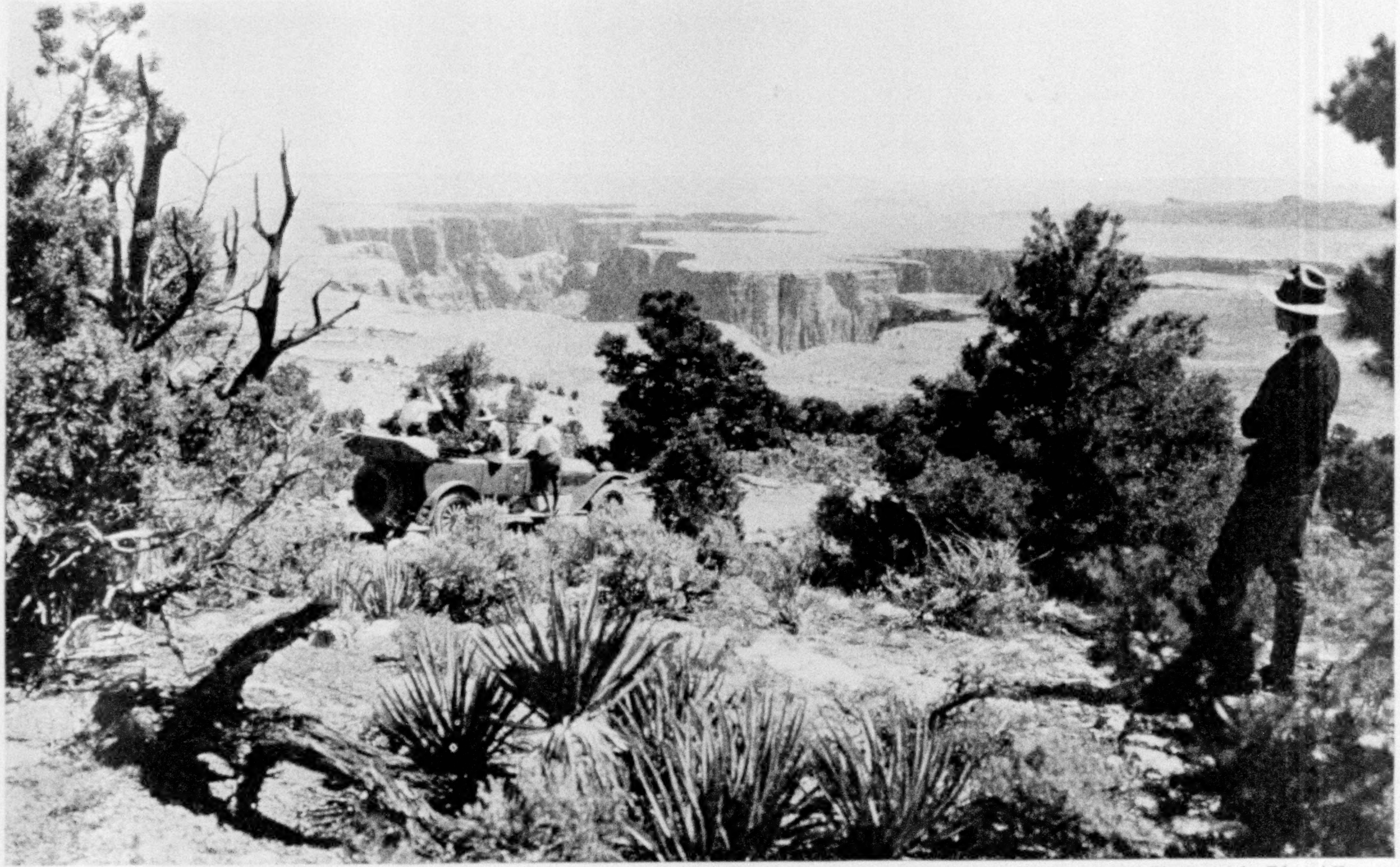
ODD, UNREAL, AS IF TRANSPLANTED FROM A LOST WORLD

Nude of leaves and twigs, the sinister, giant suagaro cactus startles all who see it for the first time. No use is made of it in Arizona, though the Papagos eat its fruit; on the Mexican west coast, a similar cactus furnishes fuel for sugar mills.

Photograph courtesy U. S. Forest Service

THE SO-CALLED CENTURY PLANT BLOOMS BUT ONCE, THEN DIES

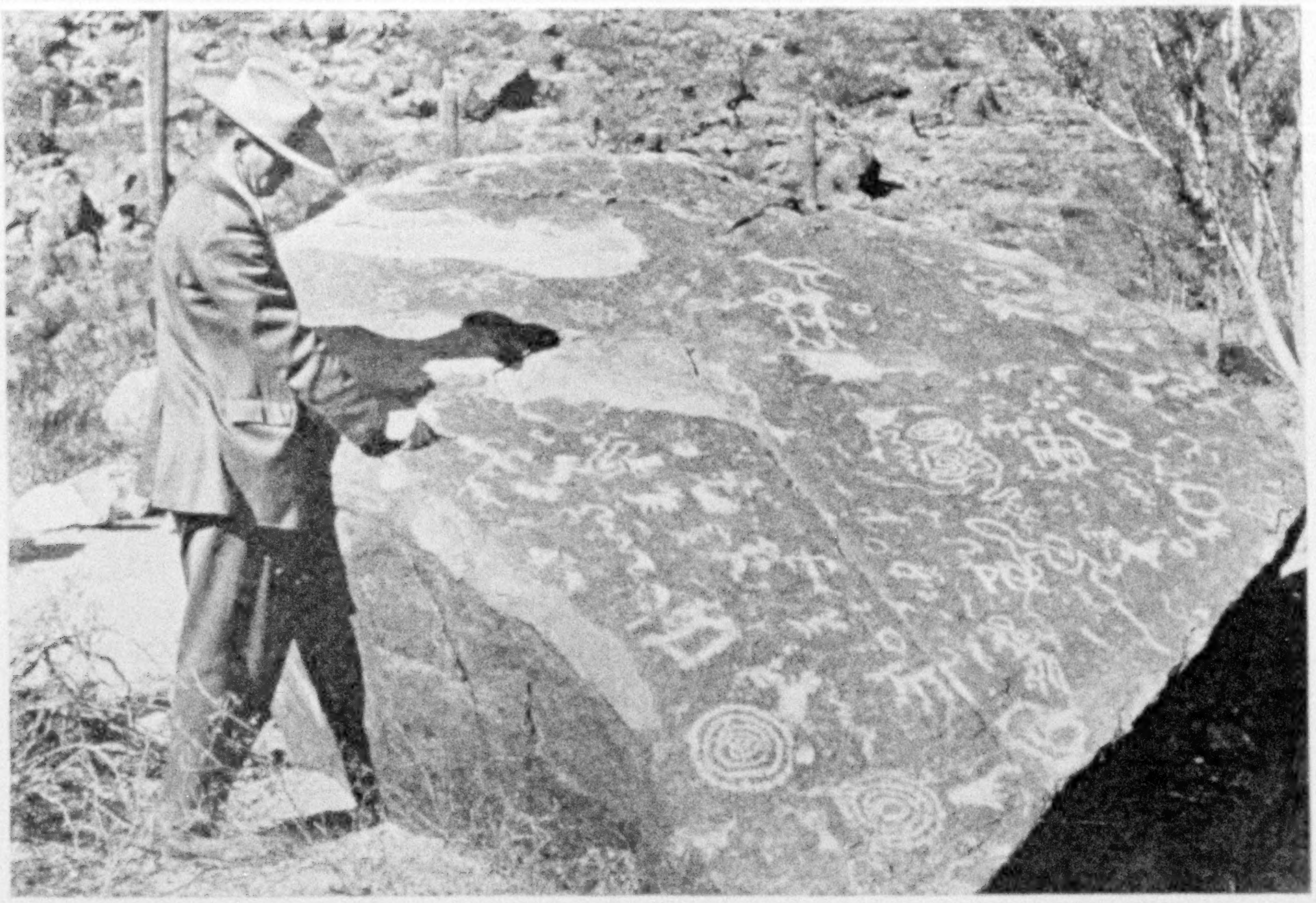
From the juice of some agave plants Mexicans distill a potent spirit known as "mescal." From the leaves of various species fiber for cordage is taken. The number of years before flowering is indefinite and is determined in each case by soil, climate, and vigor of the plant.



Photograph by Edward Kemp

A DEEP, CROOKED CRACK ACROSS THE LEVEL PAINTED DESERT MARKS THE COURSE OF THE LITTLE COLORADO

As if giants had dropped a world and burst it asunder, this startling earth cleavage suggests the enormity of some cosmoplastic cataclysm. In reality, slow erosion carved these amazing canyons across the American Southwest.



Photograph by Clifton Adams

RIDDLES OF THE PAST ARE PRESERVED IN PETROGLYPHIC ANNALS

With crude symbols and pictures of birds, animals, and snakes, the ancient sign-writers probably sought to record messages, personal achievements, and other matters of importance. Throughout the Southwest such pictographs are common. This is a "written stone" near Florence, Arizona.

golden Cibola. But for generations Spain helped pay the huge cost of her glittering European armies with gold and silver from Arizona and Sonora mines.

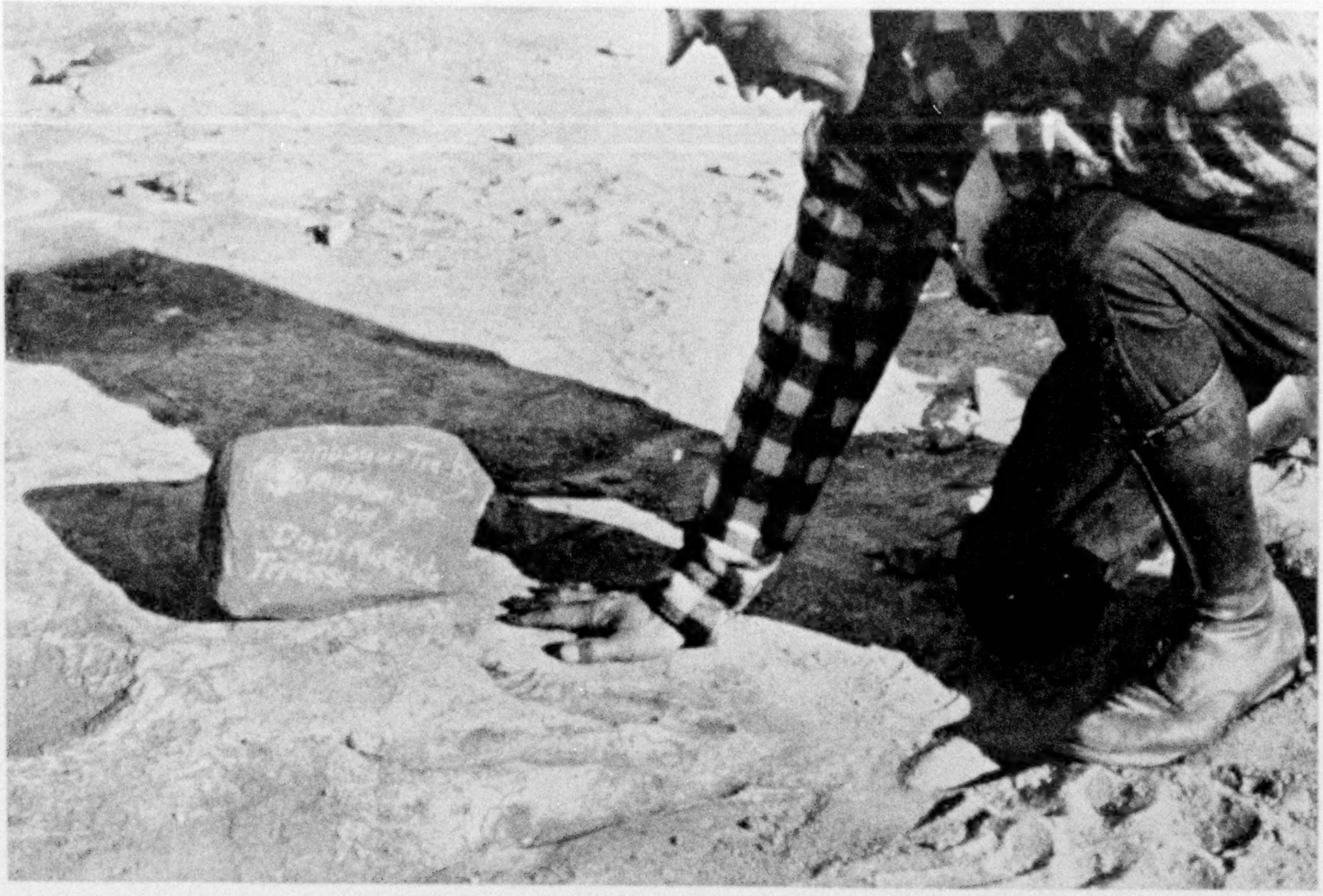
Along half-forgotten trails, where swarthy, bearded men in clanking mail drove Indians to slavery in the mines, fantastic legends never die. Credulously, modern Arizona still repeats tales of lost mines, of faded maps bequeathed by dying monks, of heavy, brass-bound treasure chests still hidden somewhere in ruins of ancient missions.

Not a rocky canyon in this vast geological kaleidoscope which is Arizona but echoes now or has echoed to the whack of the prospector's hammer and the hoarse evensong of his burro.

From the Tough Nut, the Glory Hole, and other claims incredible wealth was taken, before a subterranean river drowned the miners out.

Tombstone was first made famous by the *Arizona Kicker* and its present newspaper, the *Epitaph*. The town sank into oblivion after its boom days and lay for years dilapidated, nearly abandoned. Now, on a scenic motor highway from Bisbee to Tucson, modern mining has brought it to life again, and tourists flock to view its ruined dance halls, gambling dens, and historic Bird Cage Theater. Here early-day audiences fought and shot among themselves, and cheered such old-time players as Lotta Crabtree, Eddie Foy, and George Charlton; boisterous audiences they were, true to time and place—hard-rock miners, faro dealers, careless cowboys, predatory women—all seated at round tables and served by singing waiters. A few torn and faded posters still stick to the walls back stage, reviving memories of men and days long gone. In its time, the Bird Cage was one of the best-known theaters in this part of the United States, and the only one, perhaps, where enthusiastic playgoers might mix pistol shots with handclapping without attracting notice even from an usher.

West of the town, beside the motor highway, stands a monument to Ed Schieffelin, who made the great discovery that gave Tombstone fame and brought treasure-



Photograph by Clifton Adams

"THE WORLD'S COLDEST TRAIL," HUNTERS MIGHT WELL CALL THIS!

Thirty million years ago, geologists estimate, this hard rock was soft mud, and a dinosaur walked across it. In it he left his giant three-toed tracks. You can see them now, each toe's sharp point plainly marked in solid stone. In and near the Hopi town of Moenkopi, in northern Arizona, these tracks occur. Their size can be estimated by the man's hand, placed beside the dinosaur's footprint for comparison.

hunters even from Australia and South Africa.

The Silver King, in its heyday, was like a mine of King Solomon. From it were dug veritable chunks of pure silver. Its superintendent, tradition says, would ride about with a string of silver wire many feet long twisted around his sombrero. Stealing was common. Men on the big ore wagons would throw off rich pieces to be picked up by confederates. It was said the dust in the 5-mile road from mine to mill would have run many dollars a ton in silver.

When stone buildings at the old Vulture Camp were torn down, somebody who knew the camp history decided to run this old building stone through a stamp mill. It yielded $20 a ton in gold!

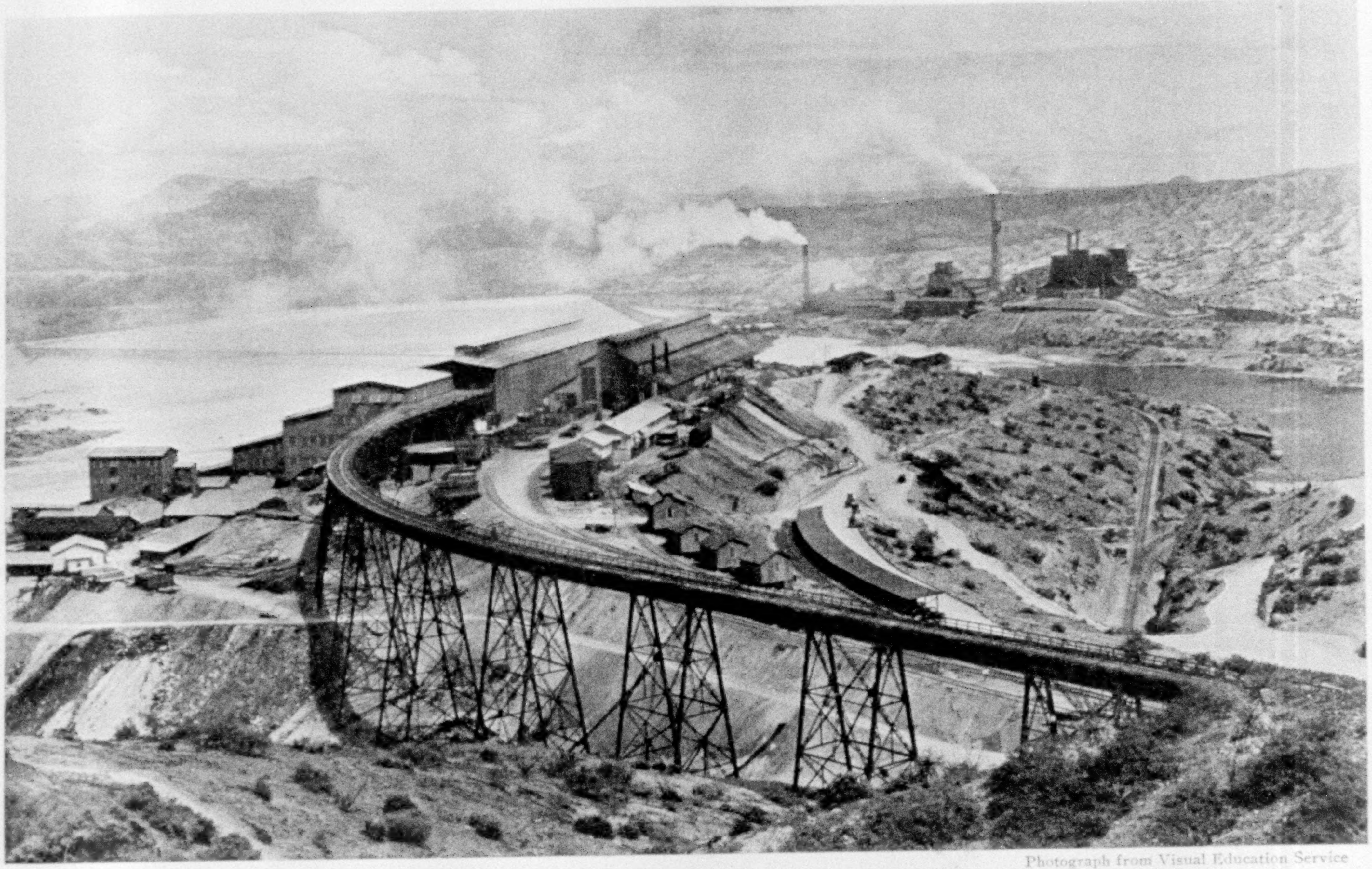
A "GOLD RUSH" IN MOTOR CARS

Mules, dragging their trace chains, upturned something bright and shiny one day, near Tombstone. It was pure silver. That claim, quickly filed, made mule-drivers rich.

As late as 1927 Arizona saw a "gold rush," when old prospectors hit a ledge between Tucson and Phœnix. But this time men went in motor cars, with thermos bottles, oil stoves, and folding cots, with traffic "cops" blowing tin whistles along the highway to control the crowds—a far cry from the days of old, when only rifle shots could stop a stage.

The old desert rat of yesterday, the professional prospector, or "optimist of the hills," whose "miner's compass" was the swinging tail of the pack mule he followed, is getting scarce now. Storekeepers, gamblers, and saloon men used to grubstake him, and not a region in Arizona but has been gophered and pecked at by this lonely man of the burro, coffeepot, pick, and blanket.

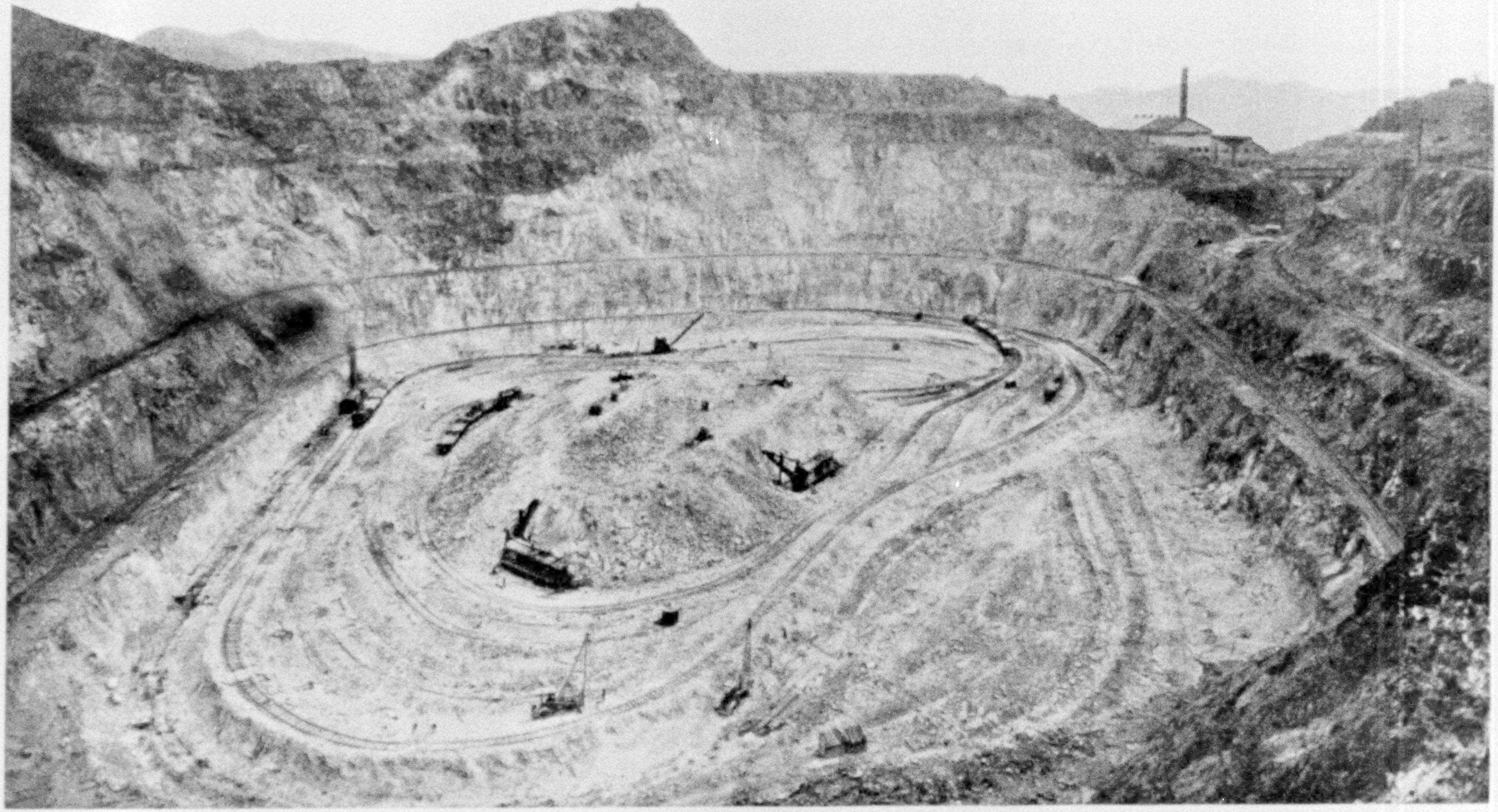
Now and then one of these lone prospectors, as in the case of Schieffelin and his famous Tombstone strike, hit it rich. In these old-timers, faith and hope never die. In a land of gamblers, the greatest of all is the prospector. But luck is less and less a factor.



Photograph from Visual Education Service

EARLY PROSPECTORS, AFOOT IN TRACKLESS HILLS, SAW IN DREAMS SUCH BUSY MINING CAMPS AS THIS

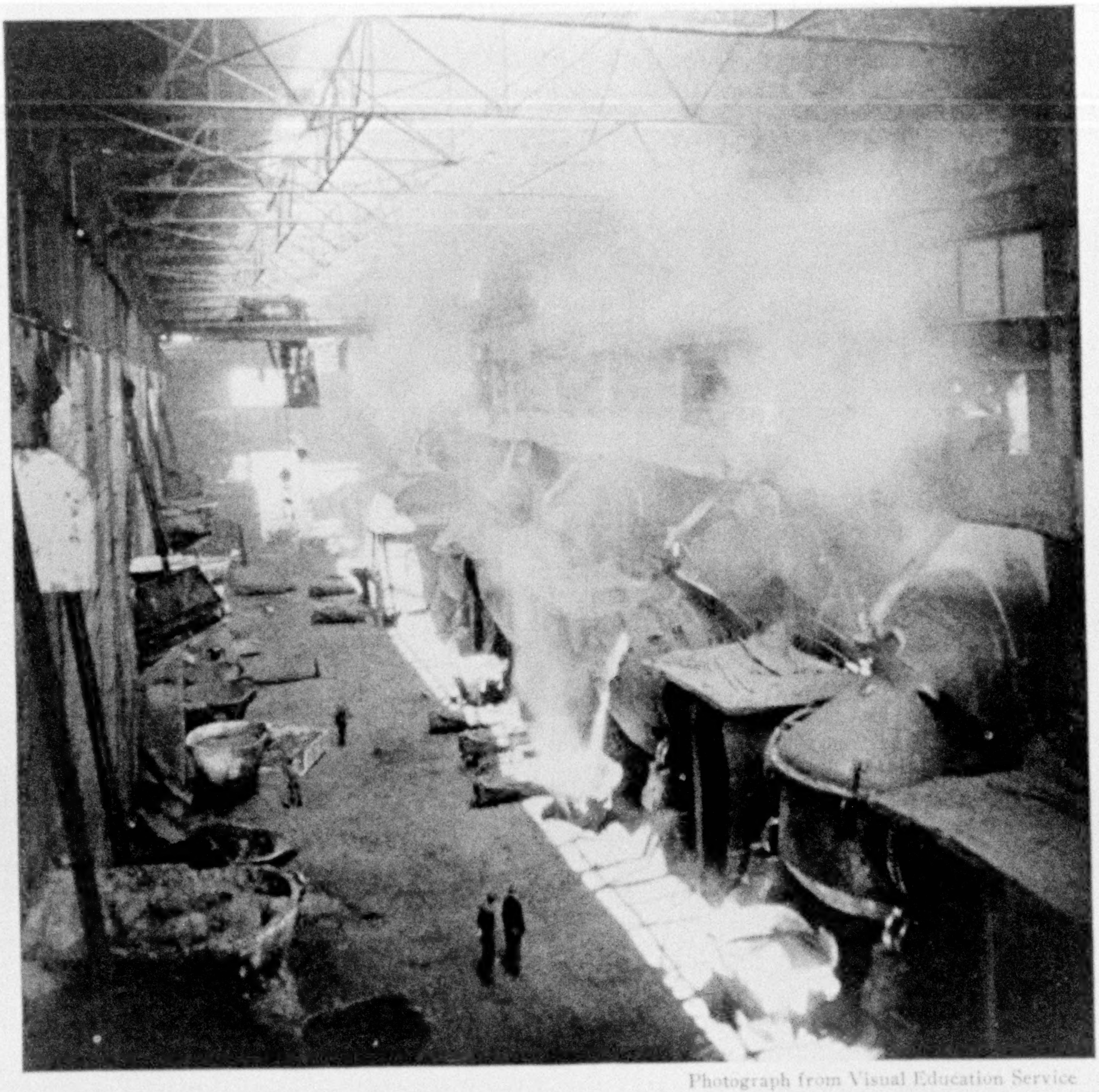
So it was, in time, that some of America's largest fortunes grew from the casual whack of a pick. Here at Miami, where copper ore comes from far underground, stand some of the State's great concentrators and smelters. Their gray smoke clouds rise now as guides to aviators, visible for miles in the clear desert air.



Photograph by Clifton Adams

HERE MAN LITERALLY "MOVED A MOUNTAIN" IN HIS QUEST FOR COPPER

Where the vast Pit now lies, with its 18-acre bottom covered by tracks, steam shovels, and ore trains, Sacramento Hill once lifted its coppery head, near Bisbee, Arizona. Hereabouts are three of the world's greatest copper mines (see, also, text, page 16).



Photograph from Visual Education Service

TURNING DIRTY ORE INTO HEAVY INGOTS OF ALMOST PURE COPPER

In this battery of furnaces, copper gets its last refining treatment. Ore is first melted in furnaces at the left, run off in little ditches, then put in buckets and lifted by machinery to the smaller furnaces on the right, one of which is seen pouring off a bright, white-hot stream of pure molten copper. Slag floats on top. From here the fluid copper is conveyed to a machine which casts it into ingots, for loading and shipping. The interior of a smelting room at Miami, Arizona.

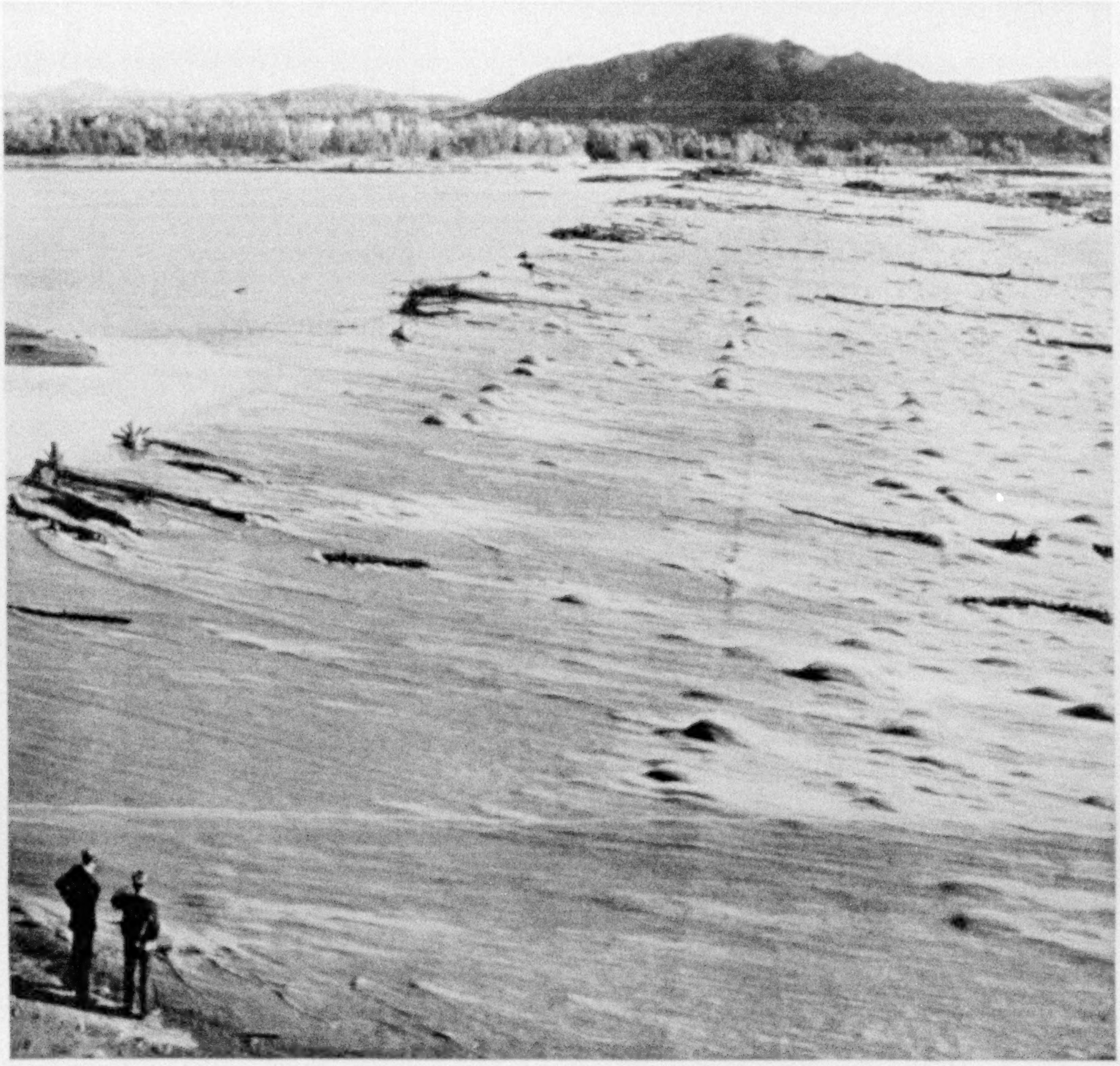
"How did you get your start?" I asked a leading miner. "Did you make a rich strike?"

"No. Fresh from Cornwall, I hit Tombstone, broke. But I was lucky. I earned $20 the first night, wrestling with a Greek in the old Bird Cage Theater. They ran me in at the last minute, because the Greek's regular opponent was sick. I knew nothing but rough-and-tumble 'Cousin Jack' style of wrestling; but somehow I flopped my Greek. Later I worked for mining men who mixed science with horse sense, and they let me ride.

"A single mine, slighted at first by experts, made many of us millionaires."

Fears that when mines were worked out Arizona might decline in wealth and population have been allayed since the World War. There are two reasons: First, the increase of farm settlers under new irrigation projects; second, discovery of ways to mine and smelt copper at lower cost.

Where low-grade copper ore occurs in great masses near the top of the ground, as at Bisbee, miners simply blast and use steam shovels. More than 1,000,000 tons of rock have been broken by one "shot."



Photograph by Clifton Adams

THE PREDATORY, VORACIOUS COLORADO, STILL DEFIANT OF FEEBLE MAN'S EFFORTS TO STEM ITS RAGING FLOODS

This great muddy stream, shifting and tricky, is at once a blessing and a menace to rich regions along its lower reaches. Breaking its banks, changing its channels, it has wrecked railways, ruined farms, and made the Salton Sea. Here it races over the 4,780-foot Laguna Diversion Dam, 12 miles north of Yuma. Waters diverted here flow 14 miles through canals on the California side, and are then carried *under the river itself*, in a 14-foot inverted siphon, to irrigate the fertile Yuma Project, south and east of Yuma.

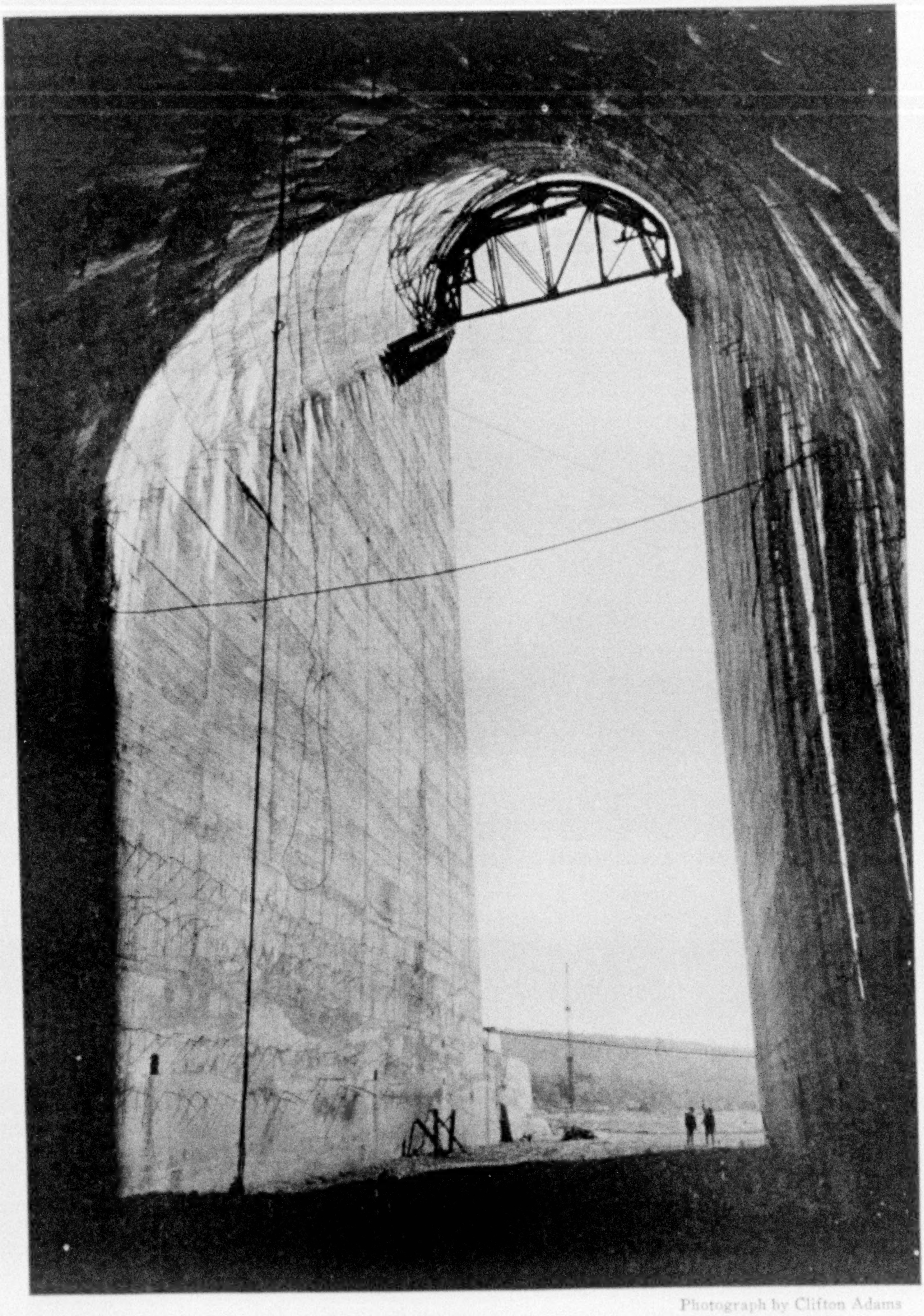
One can grasp the size of Arizona's mining industry when it is known that the State employs more than 25,000 men and digs each year 675,000,000 pounds of copper, 17,500,000 pounds of lead, 6,000,000 ounces of silver, and $5,000,000 in gold. The annual mineral output sells for more than $100,000,000.

HERE WORK AND SCIENCE MAKE THE DESERT BLOOM

Inevitably, mining will decline; but by that day Arizona believes her increased farm, fruit, live stock, and other growing industries will preserve her economic balance.

From Tombstone to Yuma, not long ago, enough lettuce didn't grow to feed a canary bird. Last season the Salt River Valley cut more than 12,000 carloads. On peak days the State ships enough lettuce to serve 15,000,000 persons!

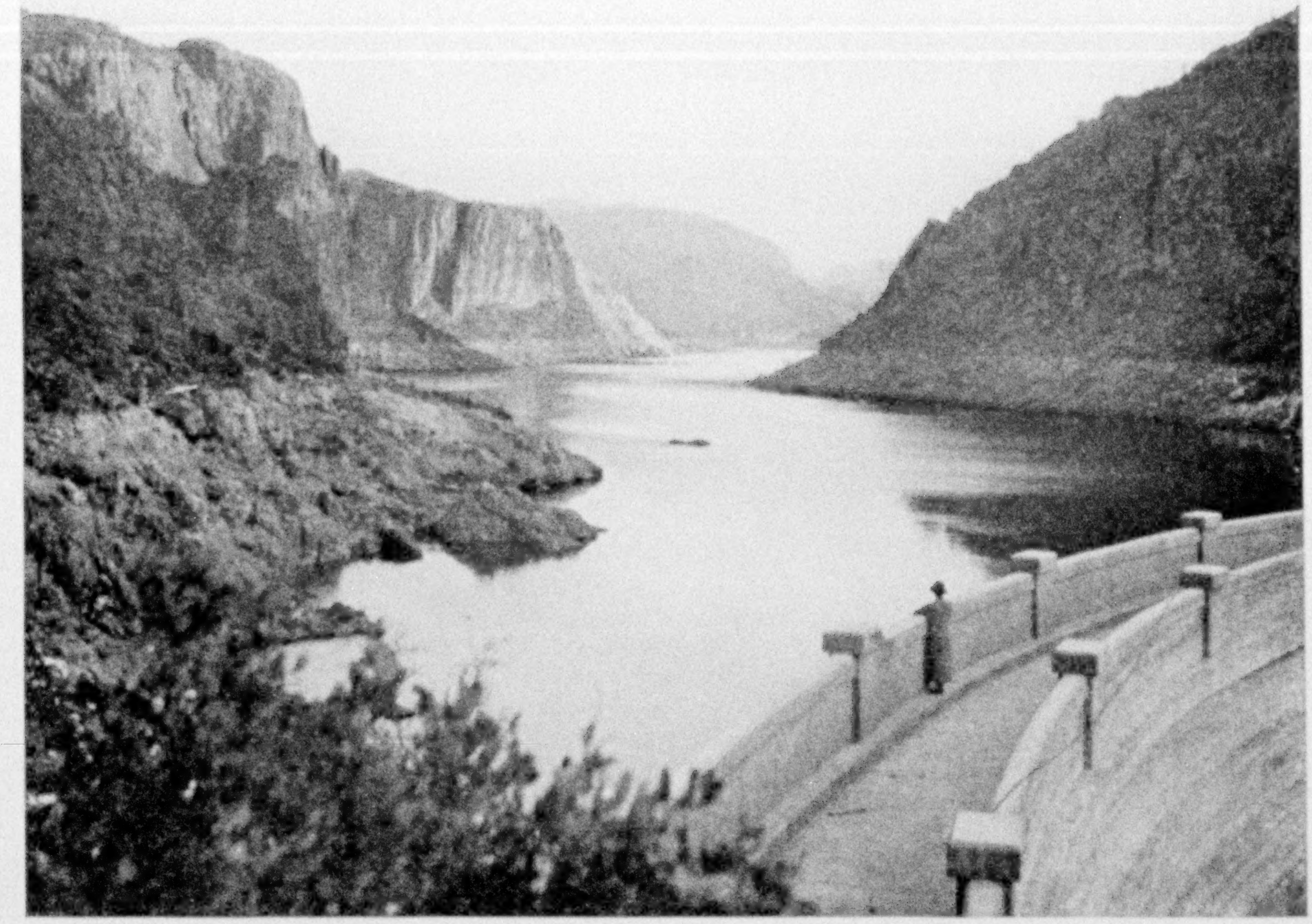
Blondin, walking Niagara on a tight rope, wasn't more careful than Arizona farmers who first experimented with citrus fruits. Now it is a rising industry,



Photograph by Clifton Adams

BOLD, GIGANTIC, IMPREGNABLE, RISE THE STUPENDOUS FEATS OF ENGINEERING, WHEN SCIENCE GUIDES MAN'S PUNY ARM

One colossal arch in a string of 27, forming the new multiple-arch Lake Pleasant irrigation dam, near Phœnix. Two hundred and sixty-two feet in height, this massive structure measures, from its base on bedrock to its towering top; one hundred and seventy-one feet from river bed to dam's rim. Behind the dam at his back, water in storage rose 110 feet above the cameraman.



Photograph by Dr. Gilbert Grosvenor

CANYON LAKE, ONE OF THE SERIES OF BEAUTIFUL ARTIFICIAL LAKES BETWEEN PHŒNIX AND ROOSEVELT DAM

These big dams benefit both farming and mining. Although built primarily to water dry land, hydroelectric power is sold to mines and other industries and to household users. This reduces irrigation charges.

selling choice fruit even to London. As in old Babylon when Herodotus came, so here irrigation makes the desert yield a hundredfold in cotton, melons, alfalfa, grain, fruit, and vegetables.

Irrigation in this region is old. Corn, beans and squash were watered by gravity ditches centuries ago. Mormons from Utah, settling near where Phœnix now is, made use of prehistoric canals. All over Salt River Valley men dig up stone implements, relics of ancient farmers.

It seems quite natural, then, that here America's modern irrigation policy should have been first tried out on a big scale. It was here with the Roosevelt Dam that the then newly formed Reclamation Service made its first big experiment, begun in 1906. It worked.

To-day there is the great Yuma Project; the big new dams at Horse Mesa and Mormon Flat, and the new multiple-dome Coolidge Dam on the Gila River, near San Carlos. The last named stands in a box canyon, 80 miles above the lands it waters. At present about 4,400 Pima Indian farmers, with 50,000 acres, are the chief beneficiaries. But, to make the project practical economically, it also waters an equal area owned by white farmers near Florence and Casa Grande.

There is a sentimental reason why these Gila Pimas deserve this aid. Spaniards, when they came in the 16th century, found this tribe growing crops watered by "bush-wing" dams. Later, friendly Pima warriors enabled Spanish settlers to stay, in the face of hostile Apaches. Stealing their women, raiding their fields, Apaches were hereditary enemies of Pimas as well as of Papagos and Maricopas.

When Uncle Sam came, these same Indians helped him with foods and as scouts and fighters against Apaches. As white

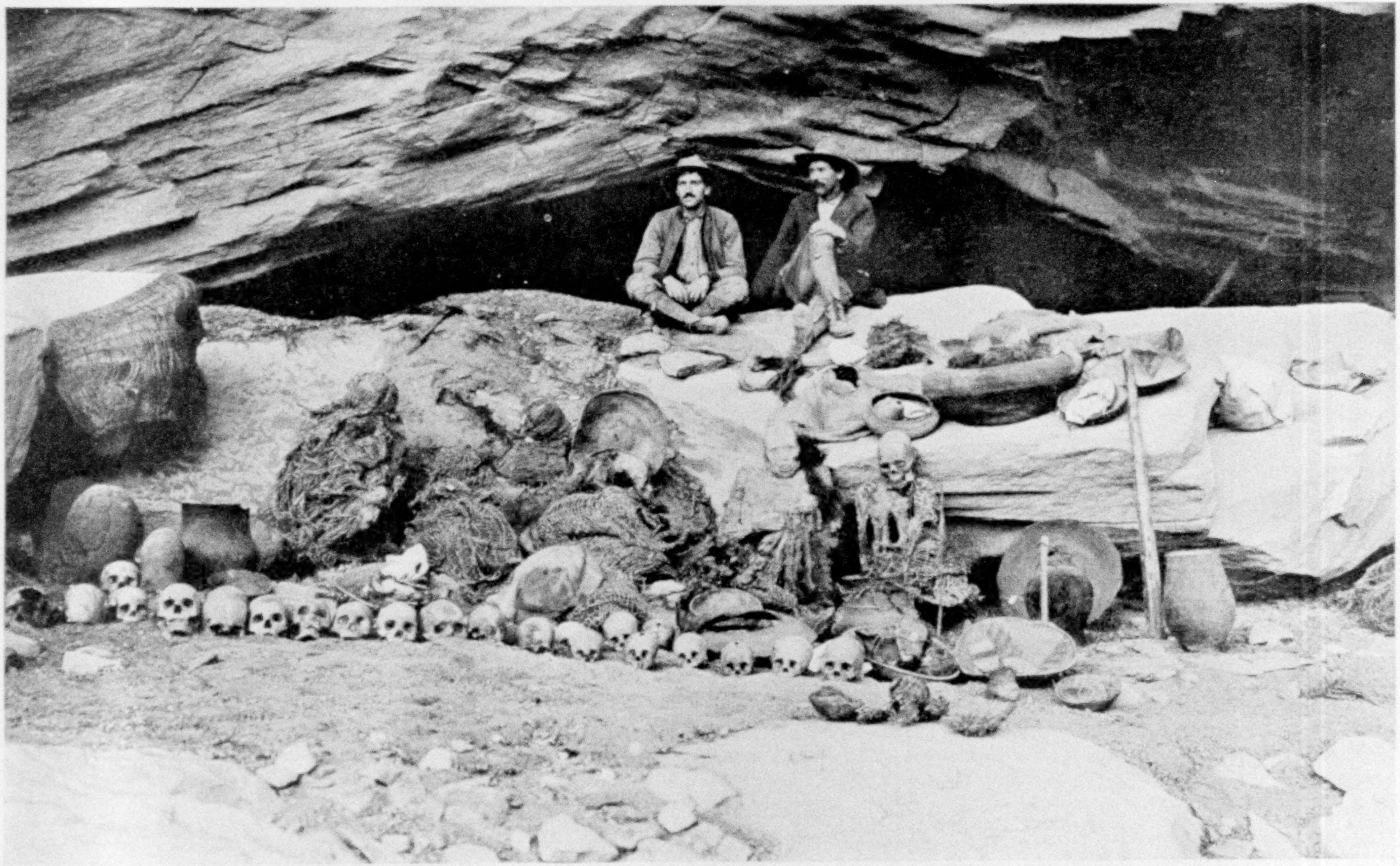
LONELY WHITE ROADS TWIST THROUGH WHINING SANDS, AMID ODD FLORAL LIFE ON A SILENT DESERT

Traffic is light on many Arizona desert roads. Toward dusk or in early morning coyotes skulk along these trails, bobcats chase rabbits, and sometimes even deer are seen. Here, too, is desert plant life as fantastic as any on earth (see, also, illustration, page 10).

Photographs by Clifton Adams

AN AFTERNOON RIDE ALONG THE ARIZONA CANAL ROAD NEAR CAMELBACK MOUNTAIN, NORTHEAST OF PHŒNIX

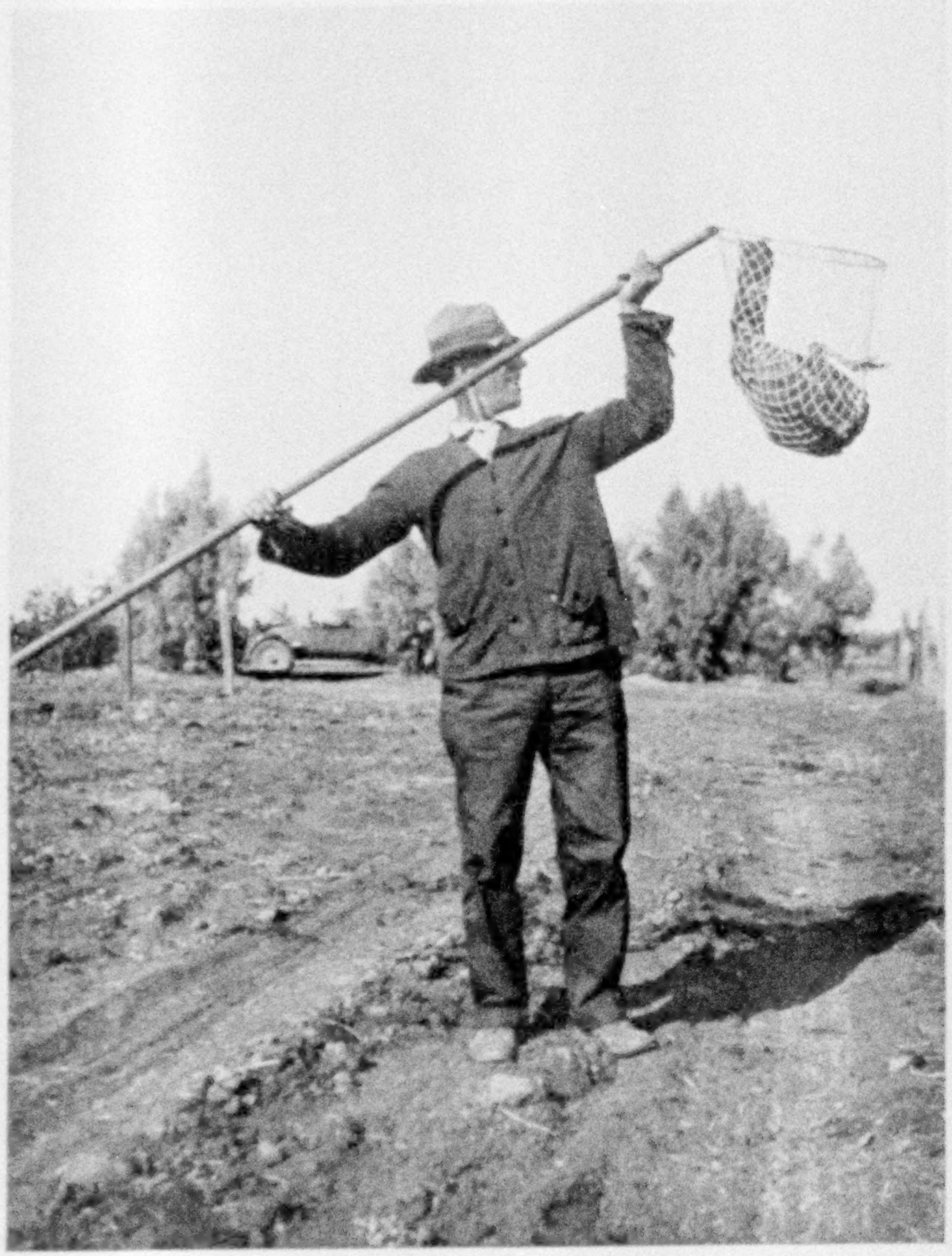
Water from the Roosevelt Dam and others of the Salt River system comes down through four main canals and is distributed to 240,000 acres through 1,500 miles of smaller canals.



Photograph by Earl H. Morris

CAVES AND CLIFFS SHELTERED PRIMITIVE ARIZONIANS UNCOUNTED CENTURIES AGO

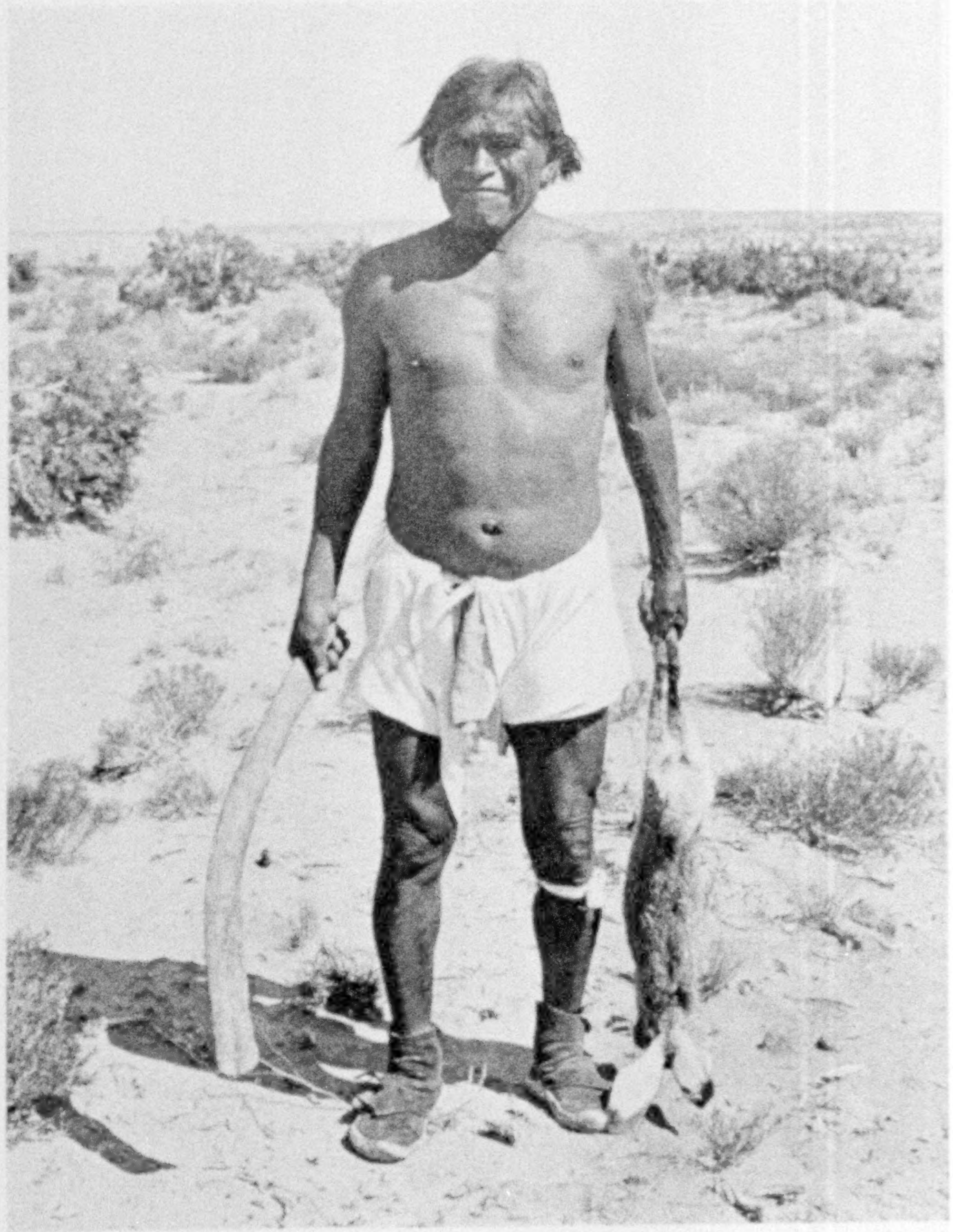
Crude tools, weapons, clothing, implements, utensils, and jewelry shown in the University Museum at Tucson reveal with astonishing clarity how ancient Arizonians toiled and spun. From this Canyon del Muerto cave came mummies, pottery, woven stuff, and other relics, some used by Navajos only about 100 years ago (see, also, "Exploring in the Canyon of Death," by Earl H. Morris, in the NATIONAL GEOGRAPHIC MAGAZINE for September, 1925).



Photograph by Frederick Simpich

THEY STOP GOBBLING WHEN CAUGHT IN A DIP NET

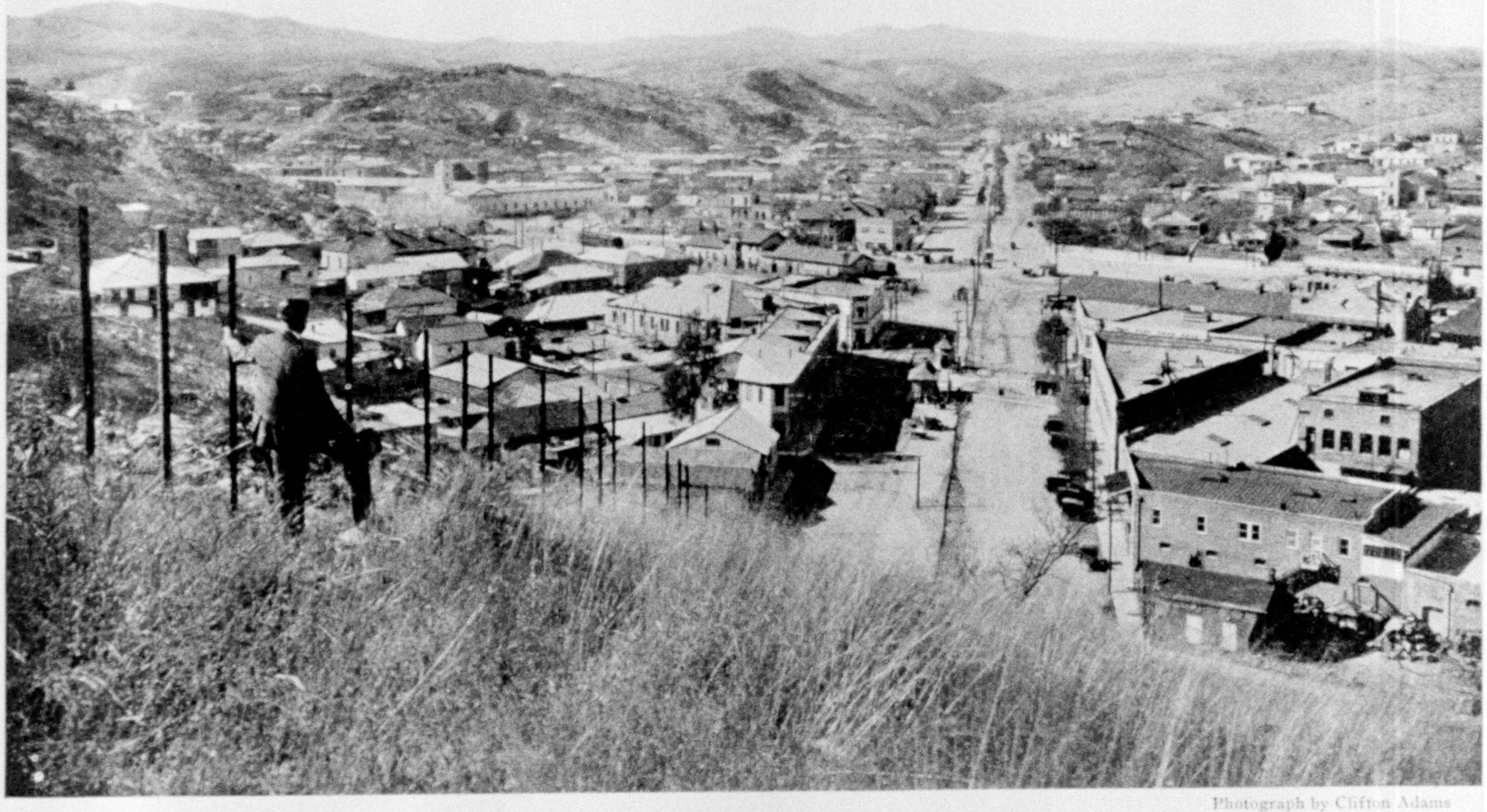
Running a turkey down and making a quick grab for his foot is an obsolete method of capture in Arizona. The dip net is easy, quick, and avoids possible injury to the bird.



Photograph by O. C. Havens

INDIANS STILL KILL GAME WITH CLUBS IN ARIZONA

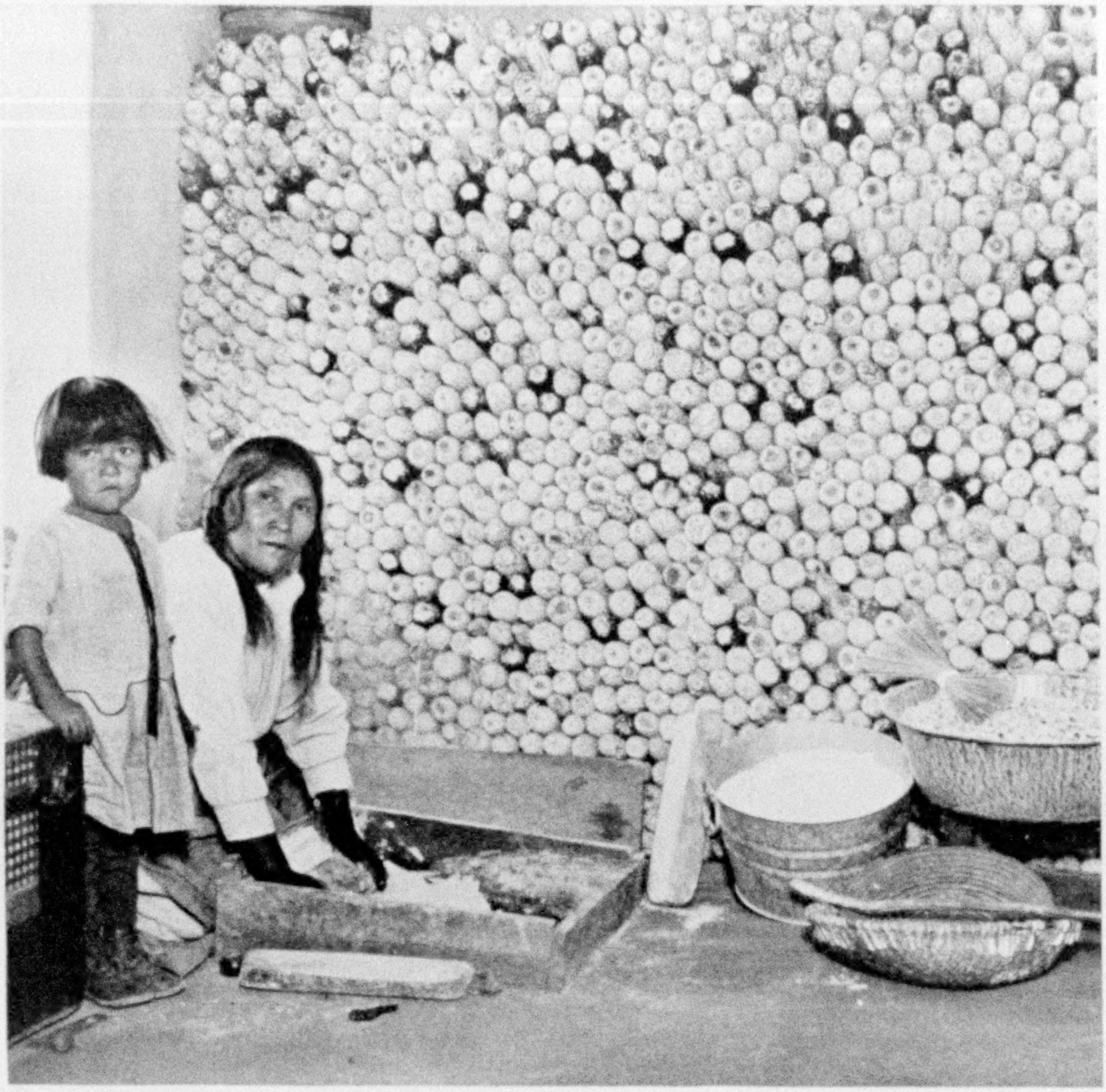
A "rabbit club," old southwestern whites call this boomeranglike hunting stick. Skillfully thrown, it breaks the legs of small game or knocks it down. A grim old Hopi hunter, defiant of Arizona's social transitions.



Photograph by Clifton Adams

NESTLING AMID BLUE HILLS, NOGALES SPRAWLS LANGUIDLY ASTRIDE THE INTERNATIONAL BOUNDARY LINE

The fence running down the street marks the line between Sonora, on the left, and Arizona, on the right, forming one Mexican and one American town. Now a busy trade and tourist gateway to Mexico's west coast, Nogales at times has been the scene of many an armed conflict, when noncombatants of both races sought safety in flight or by hiding behind adobe walls (see page 39).



Photograph by Clifton Adams

HER PEOPLE HAVE MADE CORNBREAD THIS WAY FOR CENTURIES

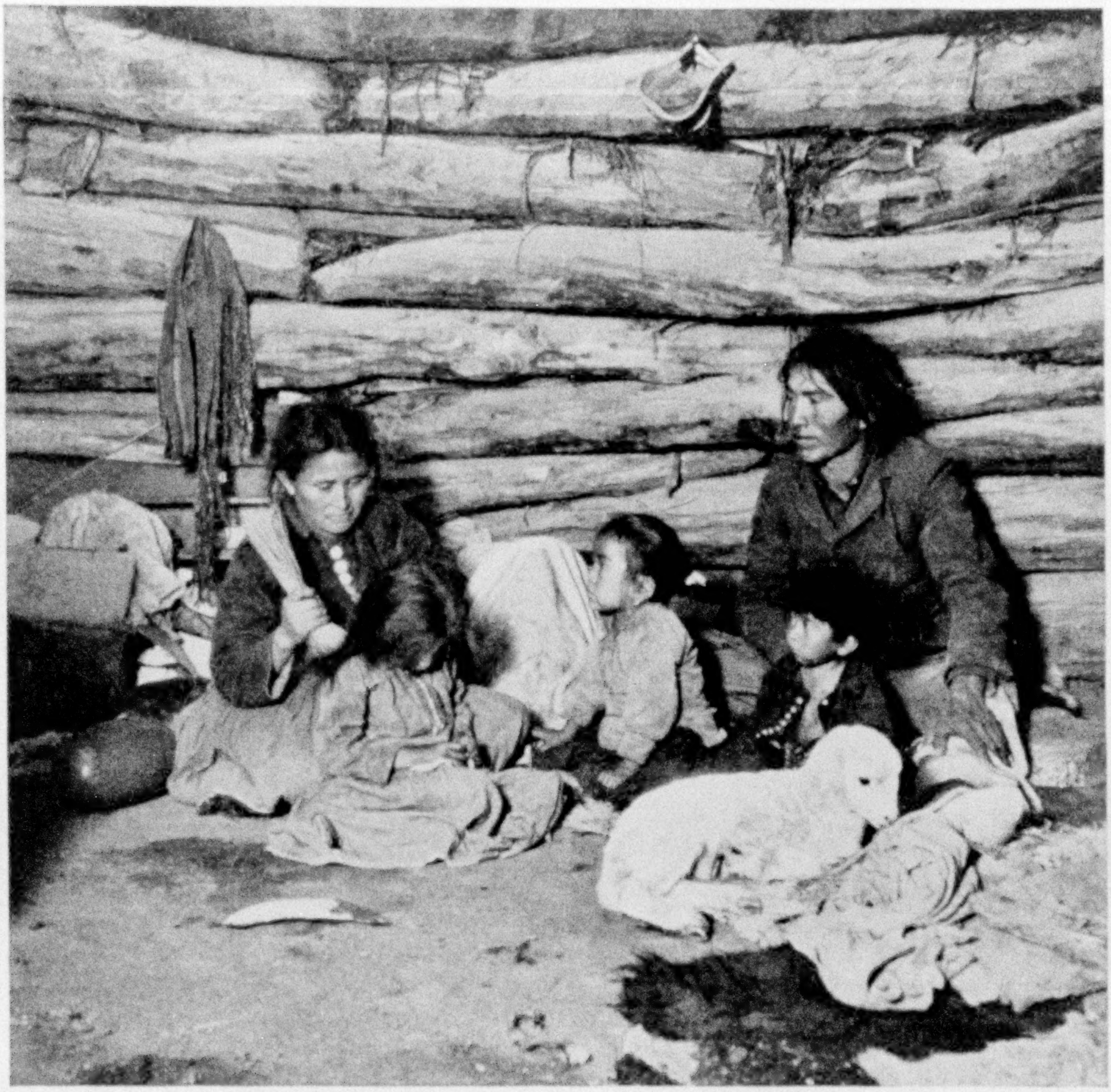
Archeology proves that among Indians of the Southwest, as with many other tribes from Mexico to South America, corn, or maize, has long been a favorite food. This Hopi squaw grates corn on a primitive *metate*, in the old Hopi town of Moenkopi, on the Western Navajo Indian Reservation, in north Arizona. After harvest, corn is shucked and stored in the Hopi's house. Often a year's supply is in storage—the lesson of a famine years ago. The ground meal is baked in the form of a thin flapjack, on a hot stone. It looks like the Mexican *tortilla* or the East Indian *chupatty*.

Gila settlers multiplied after the seventies, they used more and more of the river water available for irrigation, and their increasing herds ate up what was once free Indian range. So now, though belated, the Coolidge Dam comes, a valuable gift from the Great White Father at Washington, as recompense to his early allies.

Like Asia Minor, here is contrast between deserts and snow-capped mountains—a land of odd flora and fauna. Here one sees vast valleys of good land on which little rain falls; but up on the mountains snow and rain clouds unload. Sometimes so much water falls in the hills that, though the sun is shining in lower valleys, torrents of muddy water, carrying rocks, trees, bridges, and drowned cattle, come rushing down. Even through the heart of Nogales, after heavy rains, a wall of dirty brown water roars down, carrying old cans, driftwood, dead burros, fences—anything in its path.

To catch, store, and use this abundant water evenly is Arizona's big job to-day.

Under her new irrigation projects, her



Photograph by Clifton Adams

PINE OR CEDAR LOGS LINE THE INTERIOR OF THE NAVAJO'S DOME-SHAPED, DIRT-COVERED HUT

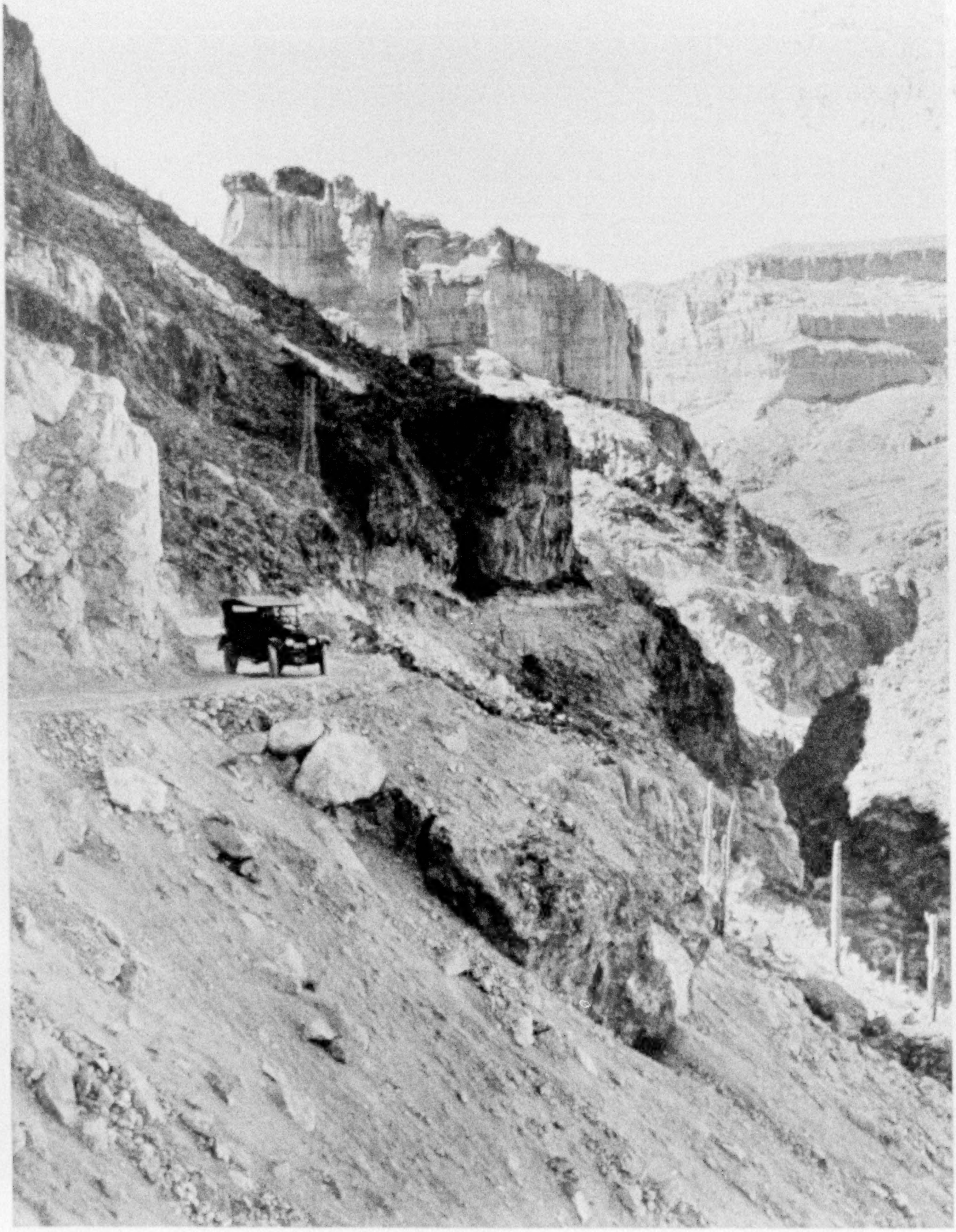
Persuading the Indians to let him enter, the cameraman got this rare view of private life inside a "hogan"—just a circular, dirt-floored room, with a big hole in its roof to let smoke out and light in. The woman is dressing her child's hair with a homemade brush. A lamb shares the family shelter, but Navajos allow no dogs inside their huts. Nomad Navajos move about the Painted Desert and to any spot on their reservation where grass and water are best. This family lives on the Navahopi road, near the Grand Canyon. Outside their hut was a "sweat-house," made of poles and mud. If a Navajo gets rheumatism or a fever, he covers the sweat-house floor with hot stones, crawls in, and covers up the entrance, taking a primitive Turkish bath.

greatest economic need now is for more farmers with capital to live on until they make crops. But always, where the last irrigation ditch ends, the hard, hot, thorny desert begins.

SMALL LIFE ON THE ARIZONA DESERT

One hears the phrase "empty desert." Empty it is, of people and large animals. Actually, it is peopled by millions of tiny fellows. Like some men, they persist in living where life is hardest. Take a walk on the desert, anywhere between Tucson and Yuma, early some hot morning, before the dust devils begin their whirling-dervish dance. Look at all the odd, fresh tracks in the soft sand. In one night so many tiny creatures have run about that their beaten paths form a net of toy highways.

Insects, big and little, subsist on the plants and on each other. Small animals



DIFFICULT HIGHWAY CONSTRUCTION THROUGH THE ROUGH APACHE COUNTRY

Looking down on its loops and switchbacks, only an aviator realizes how a road twists and struggles through such rugged lands. As a modern motor car uses all its horsepower on the steep hills and curves of many a southwestern mountain road, the reflective traveler of to-day begins to understand a little more of what the pioneers, with mules and oxteams, had to overcome when roads were merely "tracks on the ground."

and birds live on the insects or on seeds. Desert plants, like mesquite, paloverde, creosote bush, ocotillo, and cacti, usually grow some distance apart, not because the soil is poor, but because each clump requires much space from which to draw needed moisture.

Back and forth among these brush clumps the tiny wild desert things travel, seeking food. Of the small furry folk, like rabbits, chipmunks, mice, and rats, nearly all work at night to escape the hawks.

You can trace this tiny life only by getting down on the ground. There it is very plain. The so-called "empty world" of the desert isn't empty at all. From down where rats and chipmunks sit, the desert scene is like a forest of high trees cut by winding roads.

Until late afternoon no creature is astir. Then coyotes wake up and start rabbit hunting. Hawks follow the coyotes, to get a chance at any birds scared up. Toward dusk bobcats come out to stalk chipmunks. Owls join the quest for food, making life risky for rats that venture forth for seeds and bark.

THE PACK RAT BUILDS A FORT

There is the ingenious pack rat. He builds a fortlike house, often ten inches high, of sticks and pebbles. It has many doors. So, if an enemy coyote starts to dig him out from one door, the pack rat dashes out another. Along the runways to his house he scatters cholla thorns to worry those who hunt him.

One species of desert rat appears to migrate. Some years ago thousands appeared in the town of Nogales. They overran the place. At night I saw dozens of them voraciously catching bugs under street arc lights.

Then there is the lively, long-tailed kangaroo rat. Hunting the swift-running, desert scaled quail between Tubac and the Baboquivari Mountains, I saw many of these sprightly rodents. They dig long tunnels and standardized houses of many galleries under the sand. If your horse steps on one, he may sink down knee-deep and flounder.

It was a hot, starlit Arizona night. At a desert tank town the night agent, in shirt sleeves and green visor, pounded his brass keys. Moths fluttered at the foul oil lamp. Lounging in the agent's one extra chair sat a naturalist I know, out from Washington to trap desert mammals. Weeks of labor done, his specimens packed and shipped, he was waiting now for the midnight train east.

Beside him on the floor was a paper box. It had holes cut in its sides and held a live kangaroo rat, trapped that day near a mesquite-covered sand dune two miles back from the railway.

A KANGAROO RAT'S ROUND TRIP TO WASHINGTON

Suddenly, during a lull of the telegraph instrument, a sharp tapping came from the rat's box. Tap-tap—tap-tap. "Holy smokehouse!" exclaimed the agent. "That rat's a telegrapher. He's calling Tucson."

And "Tucson" the two men named him, and chatted until the dusty train roared in.

Months later, westbound, the naturalist came again to the tank town. It was night, and there was the same agent in shirt sleeves and green visor.

Under his arm the man of science carried a paper box with holes in it.

"You brought him back!" grunted the agent.

"Yes. He got weak in Washington. The climate, or the lack of right seeds. I was going to 'Frisco anyway, so I took this route."

"I'll get my lantern," said the agent.

And the two men, trudging through desert brush and sandy hillocks, finally found the very dune, and the rat-hole, where three months before Tucson had been caught.

They took the lid off Tucson's box. He jumped out and fairly popped his long tail as he flashed from sight into his familiar hole.

Arizonians are Nature lovers. They live close to her and enjoy a rich fund of animal stories.

From a circus in a hill-bound town of north Arizona, says cowboy lore, a mountain lion escaped. One hundred dollars was offered for its return. Two cowboys, idling in town, heard the news and rode off to hunt the lion. Late next day, torn, scratched, and weary, but victorious, they sought the circus manager.

"Give us that $100," they demanded. "We certainly earned it. Your big cat's roped, hog-tied, and in the corral."

"Not mine," grinned the showman. "He came home tired and hungry this morning, glad to get back in his cage and to eat his horse meat."

"That sounds ridiculous," said the cowman who told me the story, "but it isn't at all. Buffalo Jones used to tree lions with his dogs; then climb the tree himself and rope the lions. After they were pulled down and tied, he'd take a pair of clippers and cut off their claws."

A HERMITLIKE STATE HAS GROWN FRIENDLY AND SOCIABLE

Arizona has grown up hermitlike, far from seaports or big cities. Its culture is largely its own. Its people depend on each other. Towns are few; everybody of any consequence knows everybody else in the State.

There is no intrenched aristocracy, as in older communities. Here, as in pioneer days, a man is still accepted and his importance measured by his actual value to the community. In this hard, new land drones perish.

Sociologically, Arizona is as mixed up as its own geology. More than a third of its population is impossible of absorption—the Indians and Mexicans. Even were Mexican influx now checked, generations would pass before the present diverse racial and social elements could become homogeneous; maybe not even then. Much experience in the Southwest has shown little sign of racial blending among Mexicans, American Indians, and whites.

Yet it is a friendly, sociable region. One town I saw has a new fire truck. Often on Sunday afternoons the volunteer chief takes this truck out and invites American and Mexican children alike to take a ride.

To lend realism to her bid for "dude ranch" customers, Arizona may parade sombrero, spurs, and "hair pants." But they are no longer in character. Pioneers, Indian fighters, the cowled priests of mission days, live only in tradition and holiday pageantry.

I talked with one pioneer who has lived forty years in the vast lumber and sheep country that stretches from the Canyon down to the desert.

"A good rifle, polished, oiled, and always loaded, was every man's indispensable tool when I came," said he. "Indian scalps decorated some of the older cabin walls.

"Only the fit survived. And there were amusing social contrasts. Some men lived like swine; others sent their laundry all the way back to New York, by express, to get the right polish on the collars. At one time the rough log hut camp of Flagstaff boasted more college graduates than any other town its size in America. We knew, too, where each man stood on every subject, from science and superstition to missionaries and breeding guinea pigs. Debate was our chief diversion.

"When in doubt, we made our own law. There's an old story of one erratic individual whose neighbors doubted his sanity. It was rumored he had tried to train prairie dogs to dig potatoes and post holes. They haled him before a bewildered justice of the peace, who pronounced this astonishing sentence: 'The prisoner is fined $25 and dismissed with a warning!'"

Sawmills, ranches, and mines have been Arizona's social laboratory. From the slab pile one man went to the State Supreme Court bench; from a sawmill a bishop graduated, and to the United States Senate went a former cow-puncher.

PHŒNIX RISES LIKE ANOTHER BABYLON

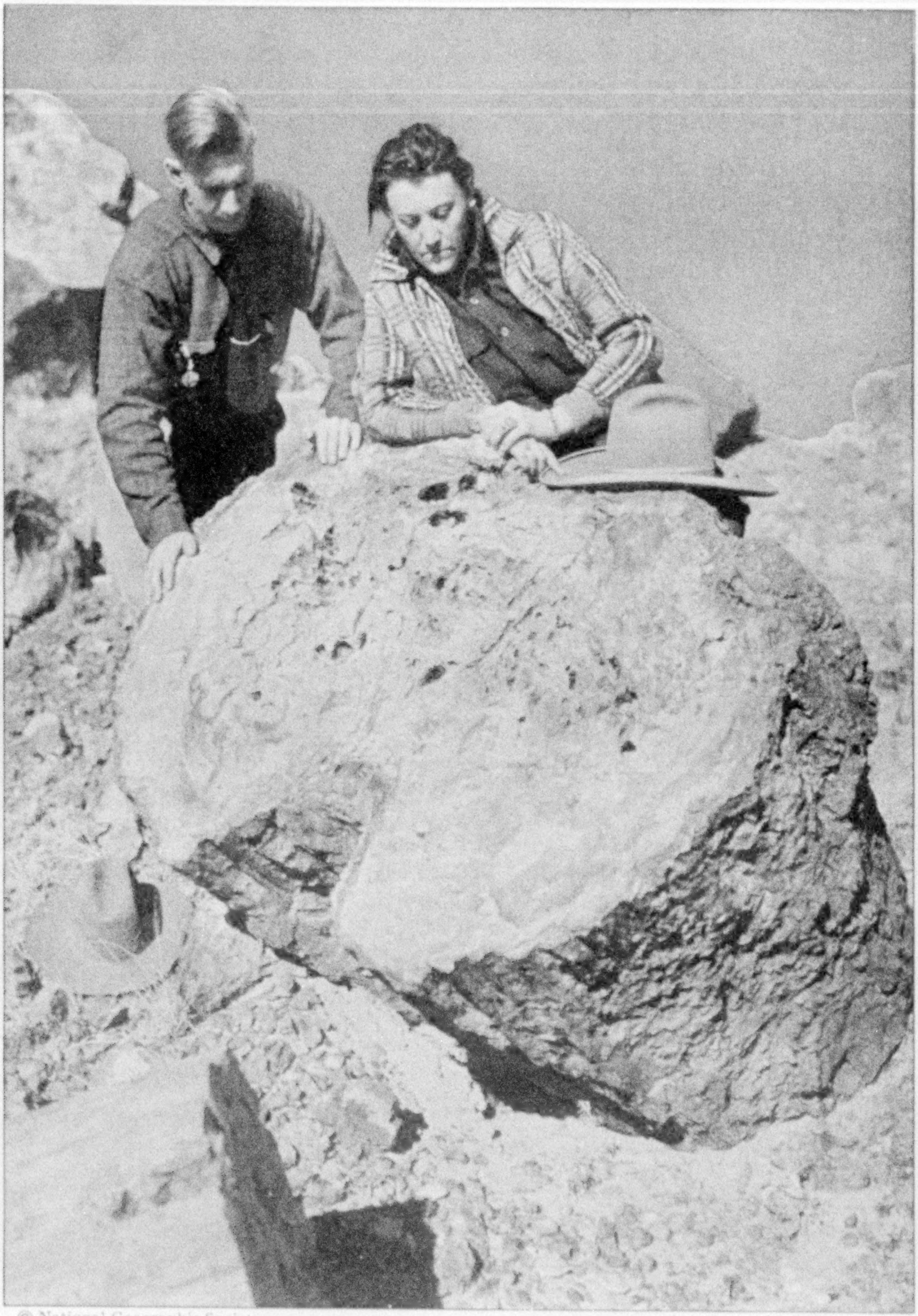
To-day, from sawmills to symphony concerts, as it were, from bellwethers to belles-lettres, Arizona's social transition is even more rapid.

Now blue Fokkers fly from the airports of Tucson and Phœnix, whisking air-minded Arizonians out to Los Angeles in a few hours, over Mexican burro teams that take days to go from desert ranch to Tucson and back.

For dance and bridge parties, women of Arizona telegraph to Los Angeles for fancy cakes and creams, and order their gowns from New York. A few hours off, on desert or mountain side, squaws parch corn for their children and make moccasins of deerhide (see pages 24, 25).

Like Baghdad, Babylon, and Cairo—like certain other magic cities of our arid West—Phœnix is the child of irrigation.

Ages ago, men lived near where Phœnix now stands, watering a fringe of the desert by crude canals. On the edge of Phœnix, now, archeologists are uncovering the crumbling, sunbaked brick homes of these ancient settlers.



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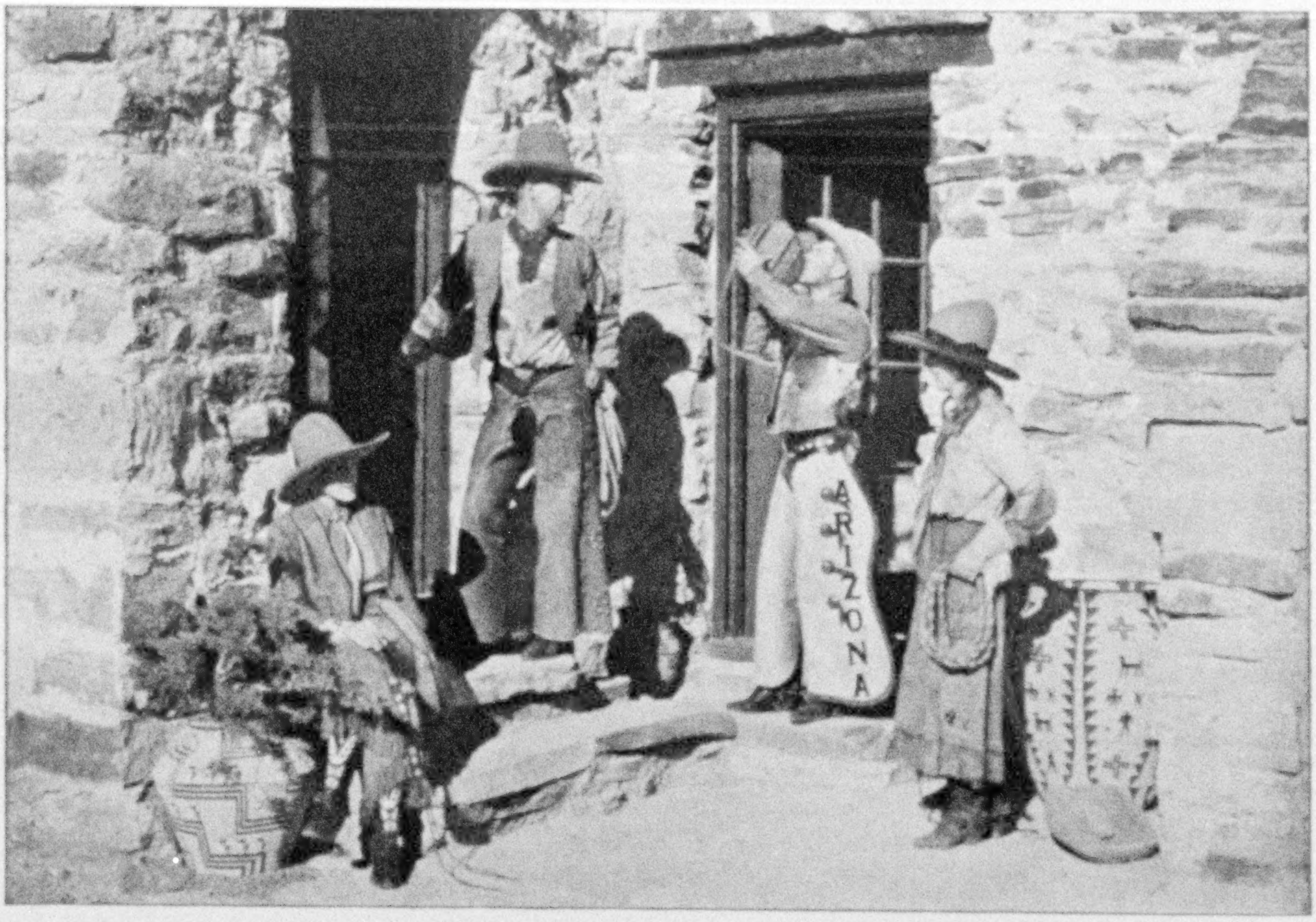
Autochrome by Clifton Adams

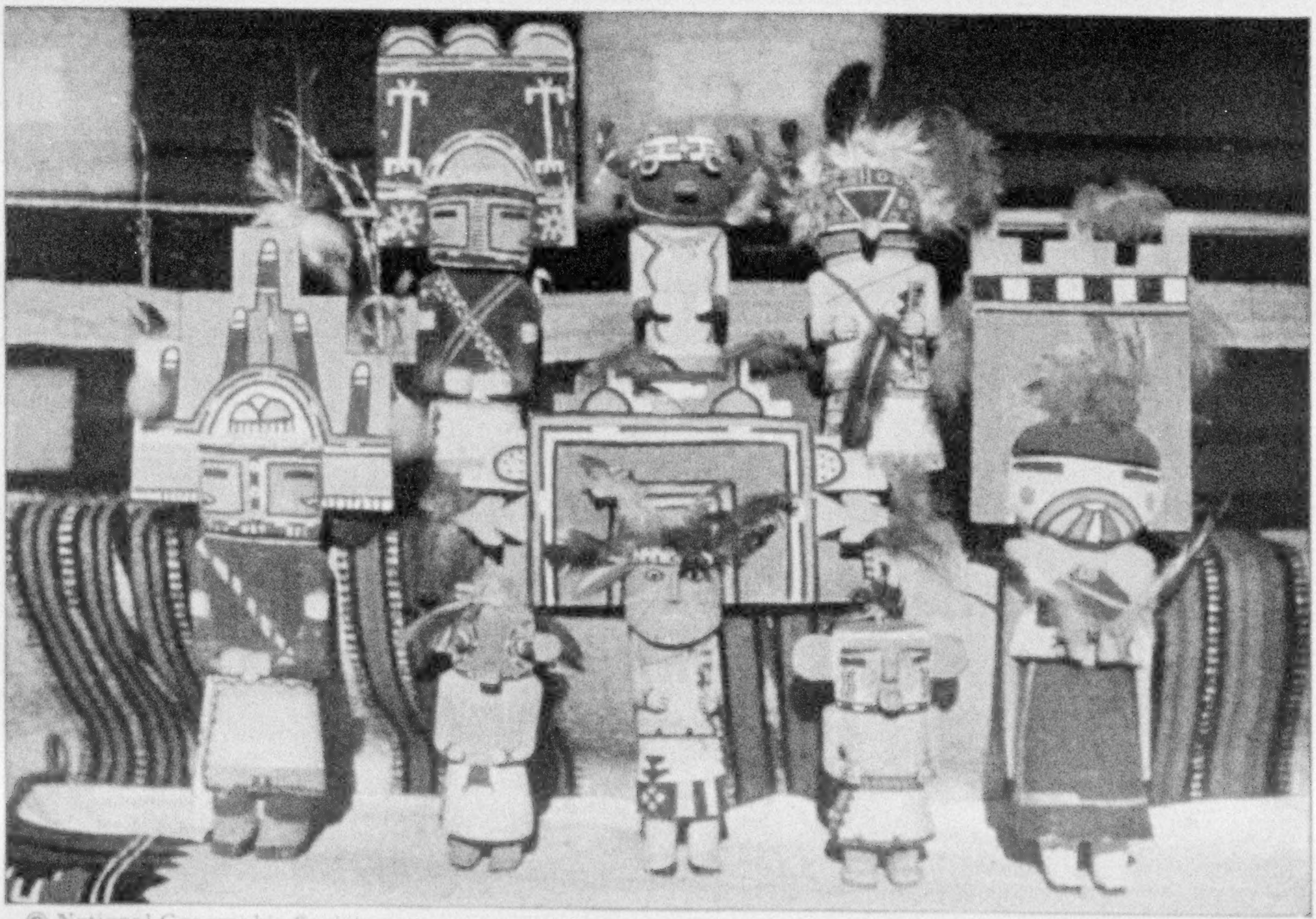
EONS AGO THIS FOREST GIANT BOWED TO THE FORCE OF THE ELEMENTS

Further back in the ages than man's imagination can reach, these great fossil trees were living things, proudly adorning the prehistoric landscape. The petrified forests of Arizona extend over an area of more than 100 square miles. To protect the most important parts of this region from destruction, a section comprising about 40 square miles has been set aside by the Government as a national monument.



"DUDE RANCH" GUESTS PRETEND TO "ROUGH IT"

Stage cowboy chaps, fancy shirts and ornamental horse gear, such as few practical cowmen ever used, are "props" supposed to add verisimilitude, and convince the tenderfoot "paying guest" that he lives like a real cow person.



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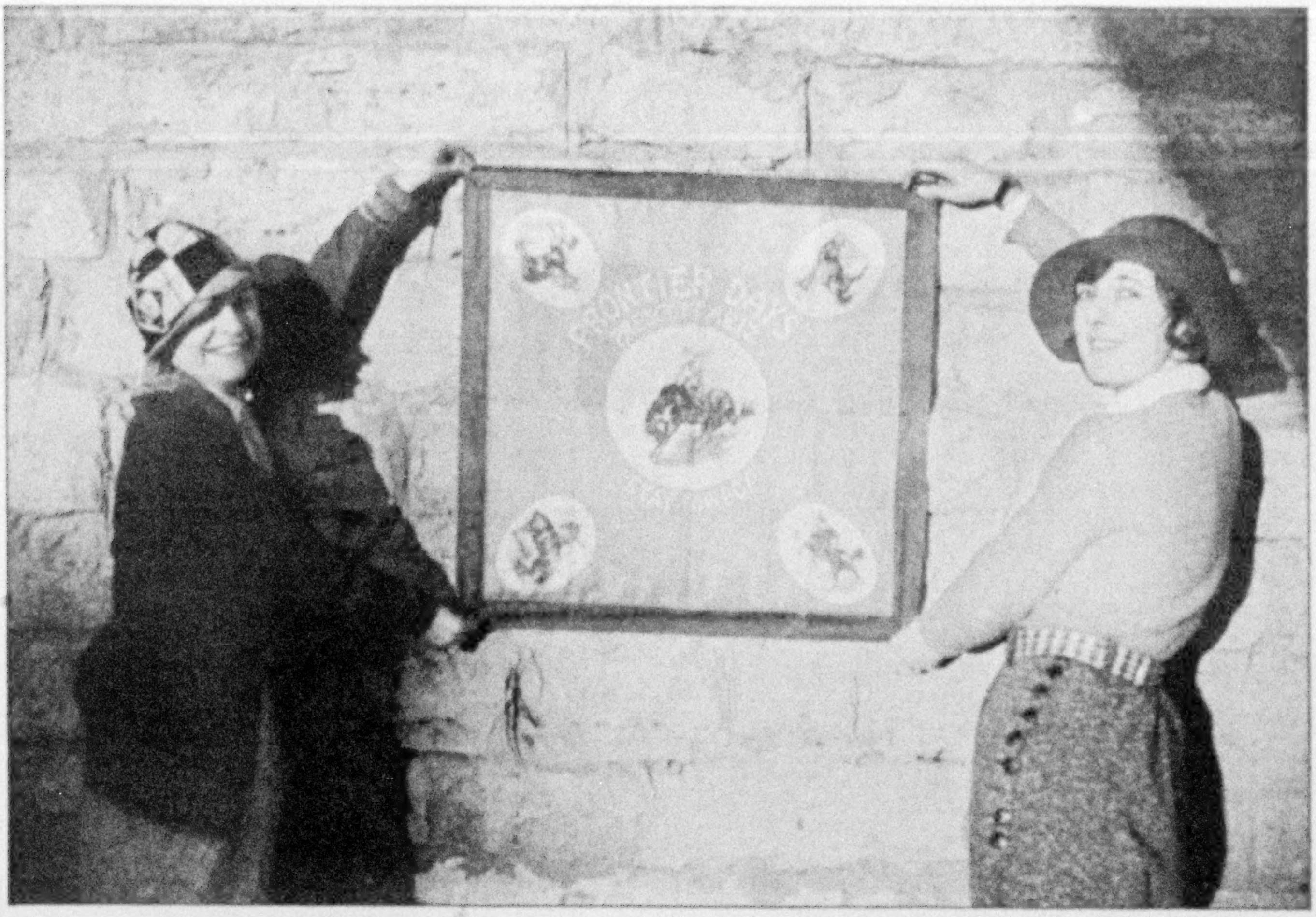
HOPI CRAFTSMEN DESIGN KACHINAS FOR THE TOURIST TRADE

According to the Hopi religion all natural objects are endowed with an inherent magical power for good or evil and take the form of minor supernatural beings. Figures symbolic of these spirits are carved from pine and cottonwood.



"RIDE HIM, COWBOY!" IS THE BRONCHOBUSTER'S SLOGAN

At Prescott's annual "Frontier Day," cowboys come from all the Southwest to contend for prizes in riding, roping, bull-dogging and other equine and bovine rough-and-tumble contests. Prescott girls display a fancy cowboy scarf.

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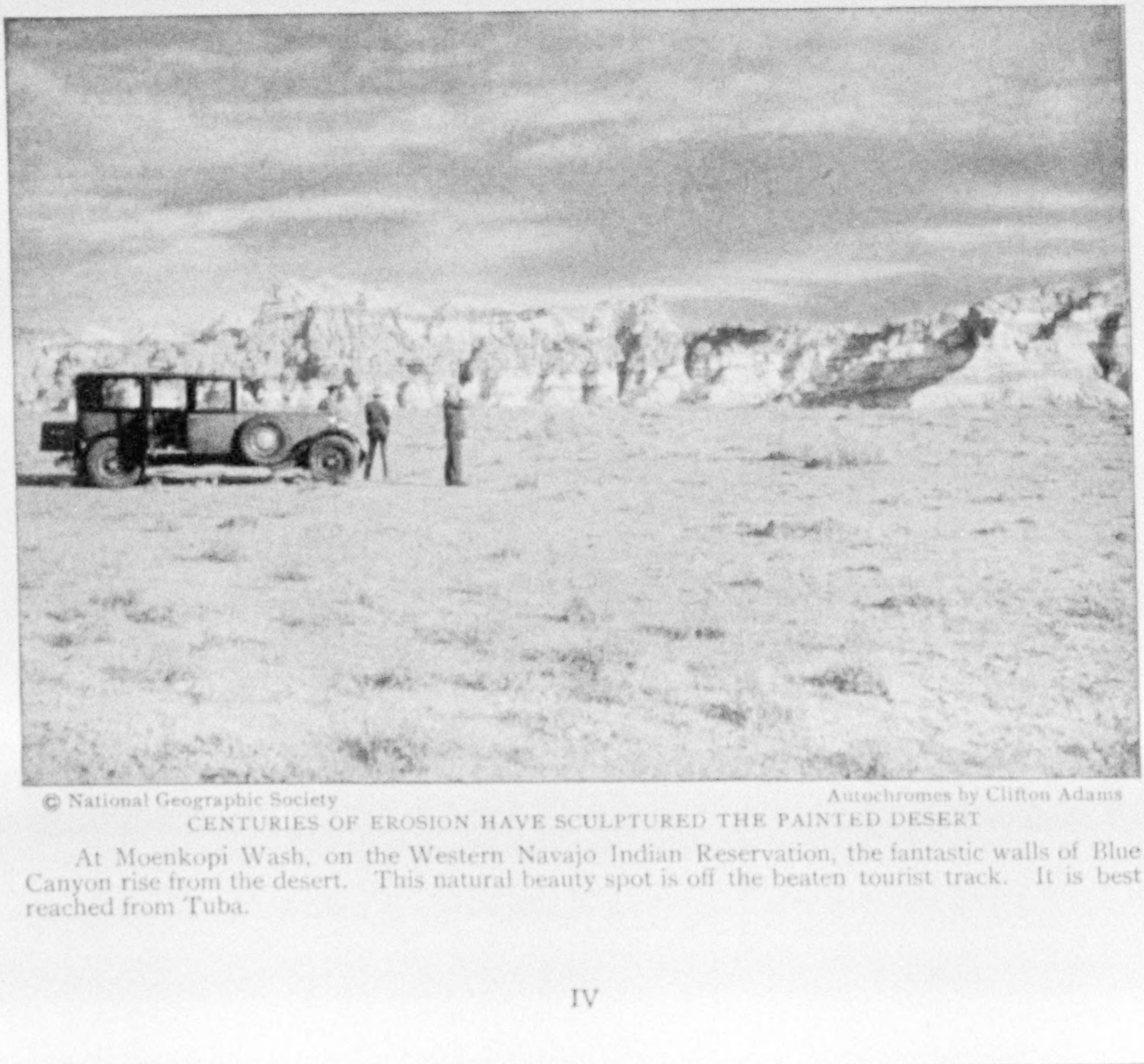
MANY OF THE WORLD'S FINEST VARIETIES OF DATES GROW IN ARIZONA

Arabs say that date palms, to grow best, "should have their roots in water and their heads in Hell"—or maximum moisture and heat. Seedling date palms at Castle Hot Springs, in the foothills of the Bradshaw Mountains, north of Phœnix.

1439
ROCK RANCH
MONTEZUMA WELL, COTTONWOOD, ARIZ.

AIRPLANES NOW ROAR WHERE ONCE THE CLUMSY STAGECOACH BOUNCED

On prompt daily schedule big planes fly from Tucson to Los Angeles, via Phœnix. These cowboys have just flown in from near Montezuma Well, to attend a rodeo at the capital.



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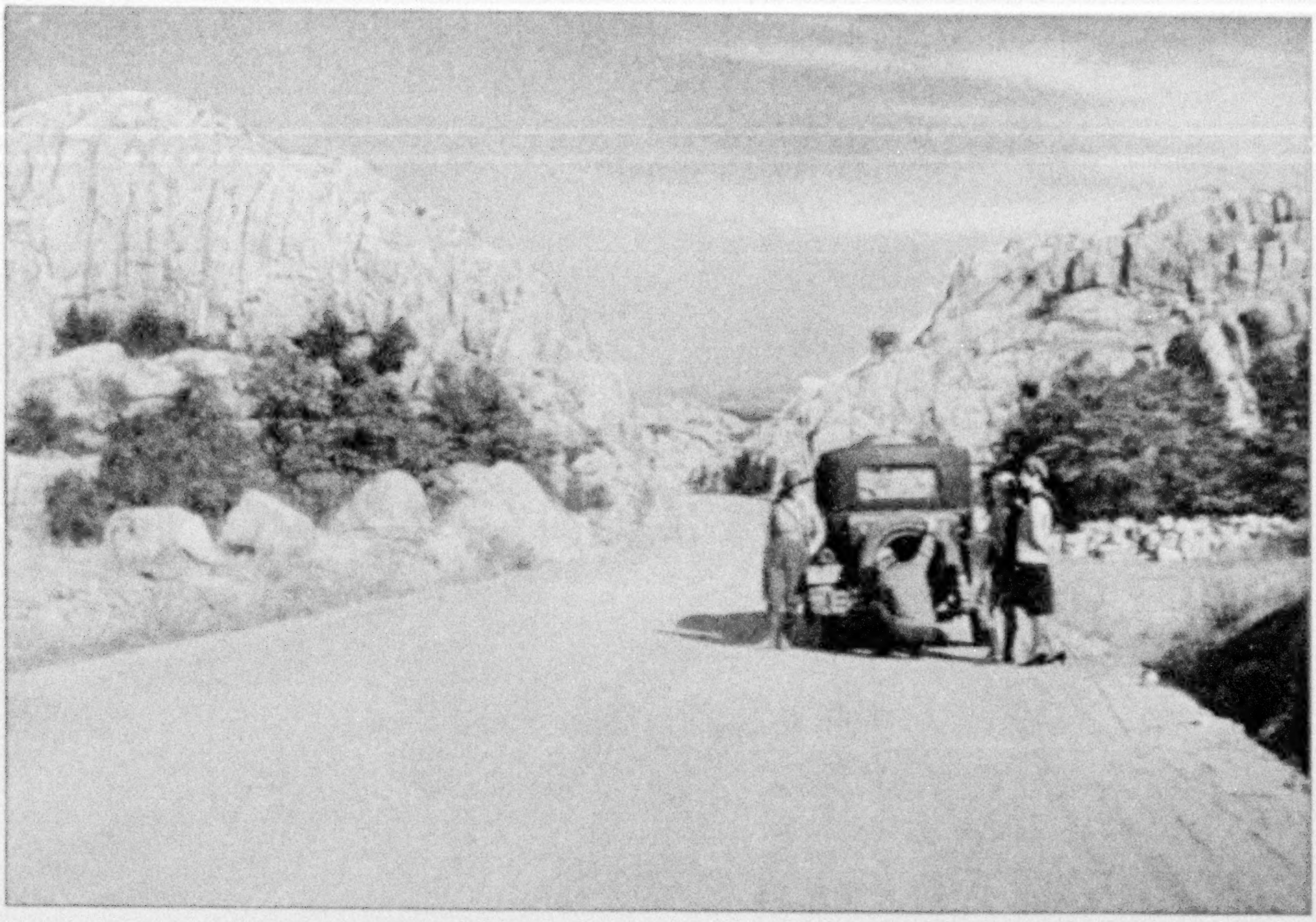
CENTURIES OF EROSION HAVE SCULPTURED THE PAINTED DESERT

At Moenkopi Wash, on the Western Navajo Indian Reservation, the fantastic walls of Blue Canyon rise from the desert. This natural beauty spot is off the beaten tourist track. It is best reached from Tuba.



MODERN HIGHWAYS FOLLOW DESERT TRAILS THE INDIAN TRAVELED

The facilities of 20th-century travel have brought to the very doors of once isolated miners and ranchers a never-ending stream of tourists from all over the United States and Canada.

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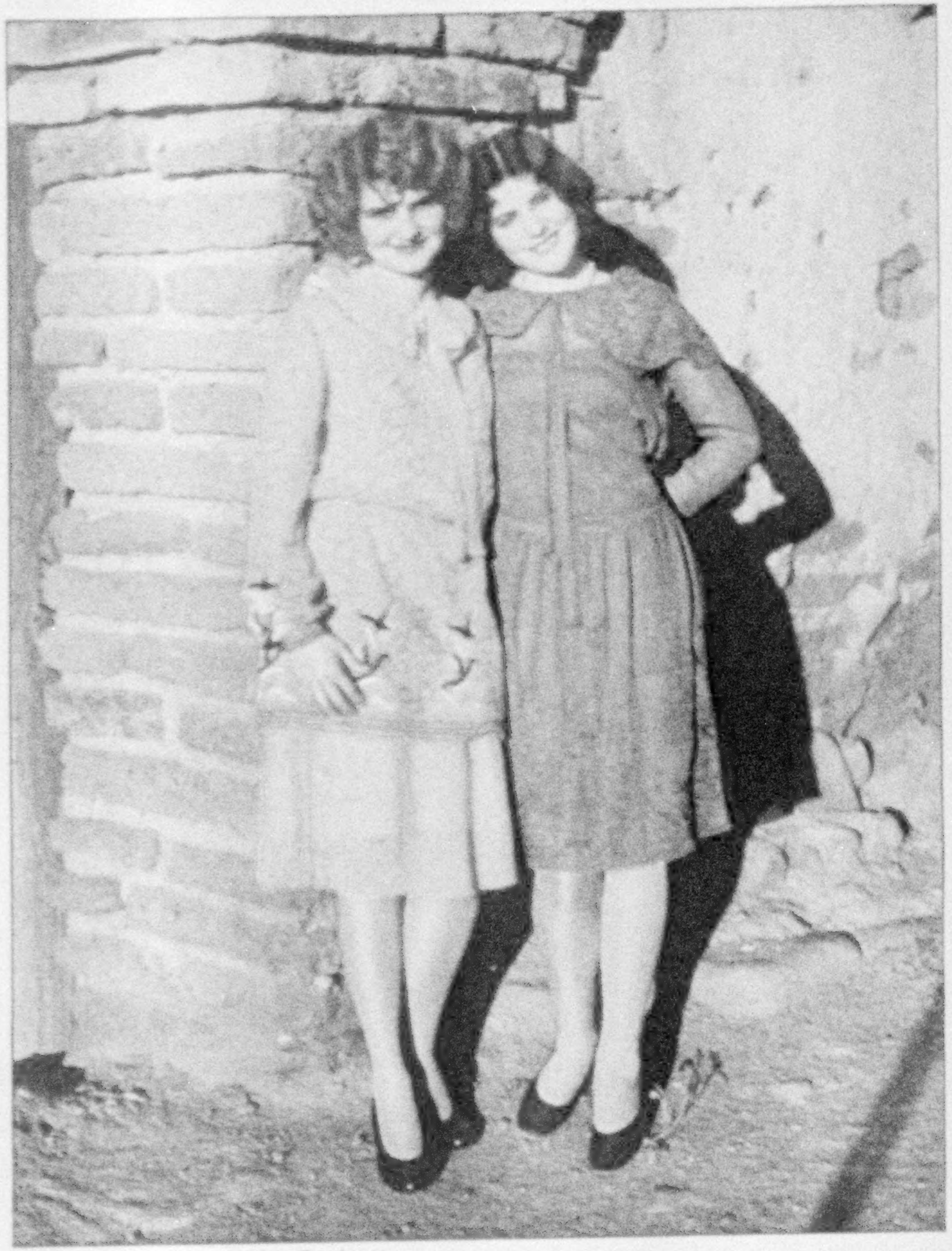
A LANDMARK OF THE TIDE OF SPANISH CONQUEST

The ruins at Tumacacori, 18 miles north of Nogales, have been made a national monument. The mission was founded by Spanish fathers in the late 17th century and is one of a chain extending from Mexico to California.



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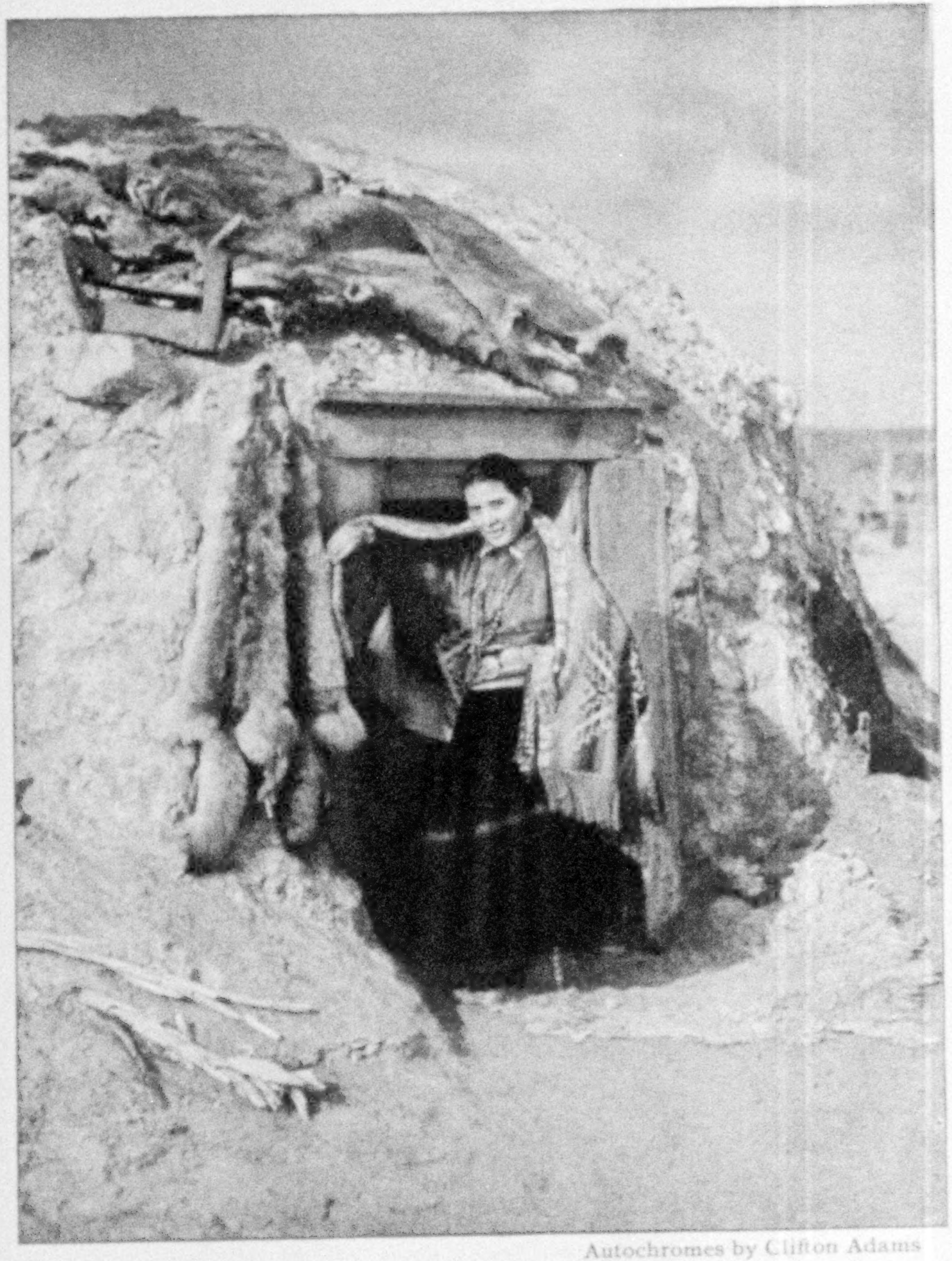
ARIZONA HAS A LARGE MEXICAN POPULATION

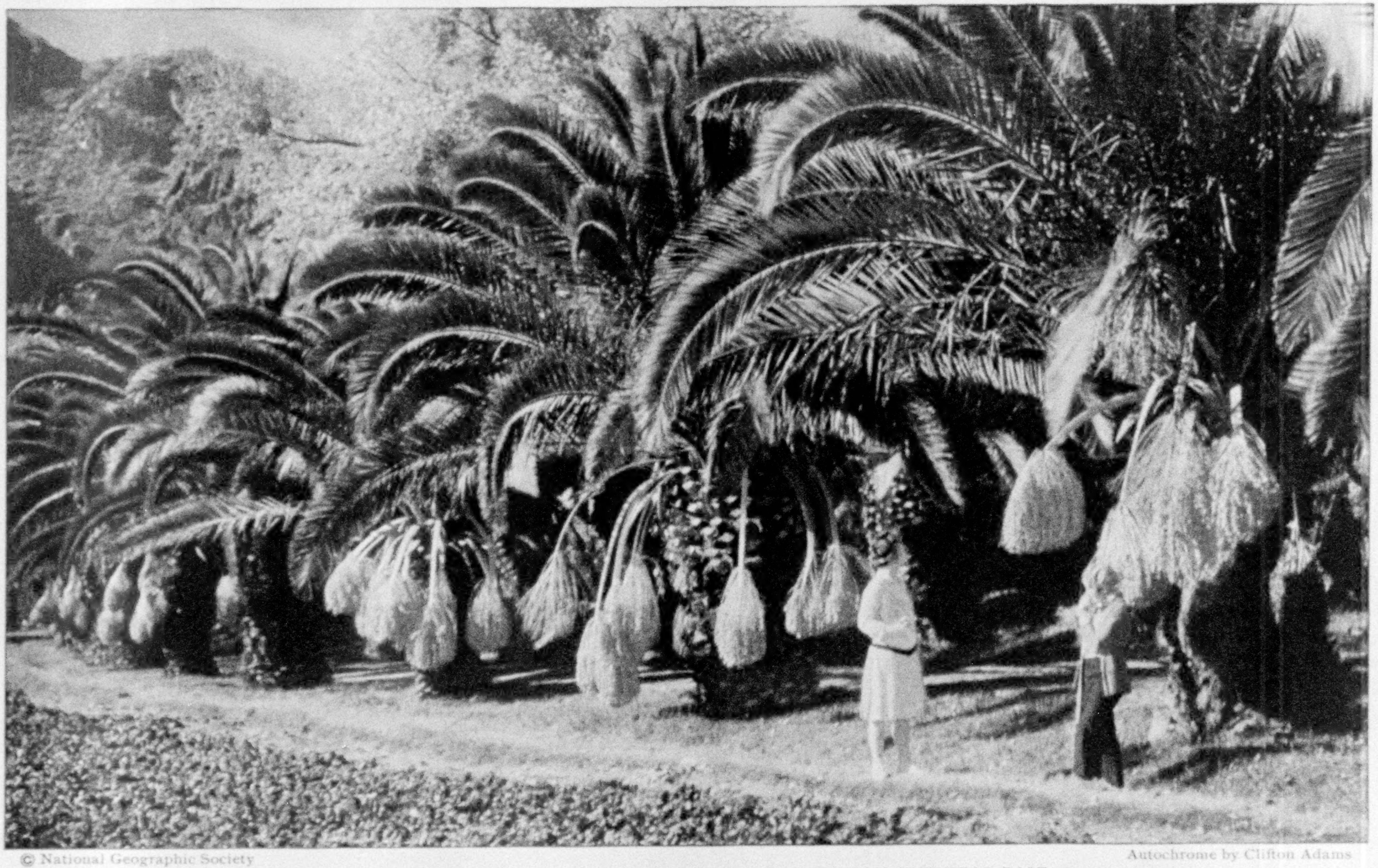
The city of Nogales, where these señoritas live, lies astride the border between the United States and Mexico. One of the girls claims a lineage that reaches back to the days of Cortez.



Autochromes by Clifton Adams

NOMADIC NAVAJOS LIVE WHERE FANCY TAKES THEM

This girl, although a graduate of one of the Indian schools and able to speak and write excellent English, lives in a hut on the Painted Desert and weaves blankets for traders.



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ANCESTORS OF ARIZONA DATE PALMS WERE BROUGHT FROM THE NEAR EAST

From Tunisia, Algeria and Iraq the U. S. Department of Agriculture imported young date trees, years ago, and planted them—experimentally—in Arizona and California. Such varieties as thrived, and were preferred by the American public, are now developed on a commercial scale (see also Color Plate III).

LUSCIOUS TANGERINES GROW IN THE SALT RIVER VALLEY

© National Geographic Society Autochromes by Clifton Adams

IRRIGATION HAS MADE ARIZONA AN IMPORTANT PRODUCER OF CITRUS FRUITS

Grapefruit and oranges of excellent quality are grown now where a few decades ago spread a blistering desert. This fruit is in great demand for the export market and is famous for its fine, sweet flavor. The 15-year-old tree pictured here, in a Yuma Valley grove, sometimes bears as many as ten boxes of grapefruit.

But it was the great Roosevelt Dam, finished in 1911, which was to make Phœnix the largest city between Texas and California. Pioneer among our reclamation projects, this great enterprise was also the first to succeed in a financial way. It converted the Salt River Valley, till then largely a desert, into one of the richest and most intensively cultivated farm regions in the world.

I saw a photostat of the check, drawn by the local Water Users' Association, payable to the U. S. Reclamation Bureau, covering the last annual installment due Uncle Sam for construction charges. It was for $708,951.14 and was, up to that time, the largest payment ever received by the Government from any reclamation project.

Adam and Eve, strolling happily through Eden, could hardly have enjoyed a more riotous plenty of fruits, flowers, and vegetables than grow here. To a singular degree, the judgment of the U. S. Reclamation Service in choosing this valley as the scene of its first great experiment has been vindicated. Besides the Roosevelt Dam, others finished or nearing completion include the Mormon Flat, Horse Mesa, and the Coolidge Dam, the last-named constructed by the Irrigation Branch of the Indian Bureau. These giant structures will impound water for power and to irrigate farms as fertile as those which amazed Herodotus when he first saw Babylonia.

Phœnix, the prosperous, populous center of railroad and highway networks, is to Arizona what Denver is to Colorado—the hub of State financial and industrial life. Impelled by the tidal wave of development now sweeping the Southwest, the capital has become a great distributing center for farm, orchard, and dairy products. Various new factories arise, making chemicals for use in the mining world; wax paper, for packing lettuce; even dog biscuit, the meat for which is supplied by the herds of wild burros that still roam the hills.

A city it is, too, of clubs, playgrounds, and towering tourist hotels; of sparkling sunshine and genial winter warmth—dry, rejuvenating and desert-scented. Like Tucson, Douglas, Chandler, and other sun-kissed Arizona cities, Phœnix affords to growing thousands a delightful break in the long train or motor trip across the continent. And to other grateful throngs, troubled by pulmonary weakness, it has become a haven of rest and recuperation.

In fact, even had Arizona never produced a pound of copper, cotton or meat, or a car of lumber, fruit or lettuce, she would still be of incalculable value to America, as a health resort. It is more than conservative to say that literally tens of thousands of weak-lunged Americans have been cured or vastly improved by residence in this dry, salubrious climate.

Amid groves of palms and evergreens nestle the red-tiled campus buildings of Arizona's University, at Tucson—a cheerful, sun-kissed seat of learning, such as the ancient Greeks enjoyed.

While my companion of the camera fussed with autochromes, posing the girls' archery and polo teams and a bevy of barefoot dancers, I talked with coeds. One carried on her shoulder a bobcat, by name Agamemnon (see page 44).

"He's so tame he's purring," I observed.

"Yes," from Aggy's watchful mistress. "We've got student-body rule here, and even the wildcats learn to purr."

TRYING TO SOLVE AN EDUCATIONAL PROBLEM

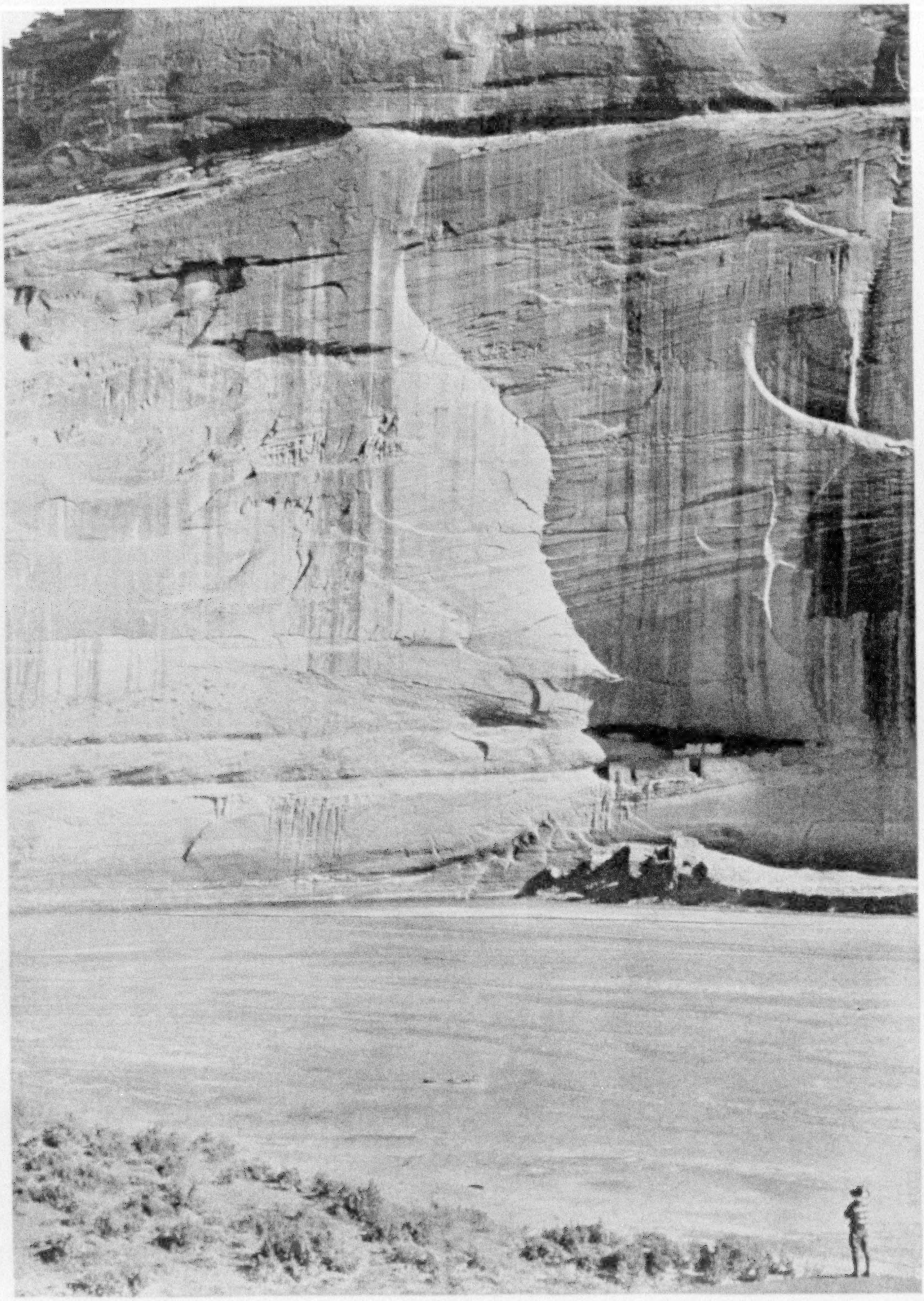
"We have all the problems here that other State universities have," said one of the deans, "and then some. Fathers who never went even to high school want their sons to go to college.

"By law, we must admit all high-school graduates who make certain grades. Hence the crowds at college gates. But many are incapable of achieving education along higher levels. We seek now, in Arizona, some fair device for sifting and sorting, so that the State can better do its work of education.

"To-day, also, too many students come with no fixed aim. They think a college diploma alone is a guarantee of social, professional, or business success. That is why it is hard for Arizona to fit the right college graduates into the right jobs. In our struggle we have classes in vocations. We try to teach them what kind of employees are wanted in the different fields of endeavor in the State."

The University seeks to place its graduates. Yet here, as in other States, many are driving trucks or running gas stations.

Far up sparsely settled canyons and out



Photograph by Neil M. Judd

A HEROIC ETCHING BY TIME AND WIND

The smooth, towering walls of Canyon de Chelly, where erosion weaves its weird patterns, are conspicuous even in this Arizona land of topsy-turvy topographical contrasts. At the base of the cliff, to the right, are the ruins of cliff-dwellers' homes.

on lonely ranges I met the community bus, hauling children miles to public school. Towns and country homes are far between. So the Arizona struggle for education is more visible. It's a poor State, as revenues go. Much of its best areas are held as national parks, forest or Indian reservations. From these the State gets no taxes. So the school tax is heavy.

But, measured by its youth and circumstances, Arizona's public-school system is good. One educational riddle in particular it boldly attacks. Its high schools seek to work with its University in testing students, to find those fit for college.

ARTIFICIAL LAKES MAKE NORTHERN ARIZONA A LITTLE SWITZERLAND

For that type of tripper thrilled only by marching past flocks of marble men in a Sieges-Allée, or craning at cathedrals in Italy, there isn't much in Arizona to see. For urban-minded folk, doting on drama or craving café life, there's even less. "Night life" passed with the Bird Cage at Tombstone, the Legal Tender at Tucson, and the dance halls in Brewery Gulch at Bisbee.

Yet, since 1920, Arizona's tourist traffic has grown more than 1,000 per cent. Now, winter playground hunters flock to the State, to her ever-multiplying hotels, auto camps, and dude ranches. In Phœnix, last winter, 2,500 people a night slept in the auto camps. At Flagstaff, among 51 motor cars parked about a hotel, I saw licenses from 22 different States and two from Canada. By train and auto, more than 200,000 people saw the Grand Canyon in 1928.

Ten years ago a dozen tourists a day, coming from Tucson down to Nogales, were a crowd of sight-seers. Last year close to 15,000 motor-car parties visited this bilingual town that sprawls astride the international border. Since the recent completion of the Southern Pacific Railroad line down the Mexican west coast, one may ride from Los Angeles to Mexico City. This puts old Nogales, once but a camping place for Forty-niners, on one of the main railways tying up the two republics—a new channel of north and south tourist travel.

Along the transcontinental motor highways that cross Arizona from east to west flows an ever-rising tide of traffic. Through Douglas, Bisbee, and Tombstone, near the border, and through Flagstaff and Williams, on the Santa Fe Trail, 300 and 400 automobiles a day pass. Most of these, of course, are going to and from California.

The bulk of this vast stream keeps moving, with perhaps one night in Arizona. Part of it halts—for days or weeks. But, with Arizona as its direct objective, its winter playground, comes yet another distinct and growing body of visitors. "The winter colony" it calls itself. Phœnix and Tucson are to it what Cairo and Nice are to Europe. To overland trains its private cars are attached. It comes with maid, valet, and governess. For bungalows and hotel suites it pays more in a day than cowboys earn in a month.

To the Arizonian this sudden popularity of his State is somewhat astonishing. I remember when the average dweller here had one big ambition: to make money enough to quit and go to California. This spirit was shown by the manner of life. Few people built expensive homes; many were content with mere temporary shacks. Arizonians felt no personal pride in their State. Now this is changing fast. It is difficult to explain all the reasons. One is this: the native sees increasing thousands of tourists pouring in, enchanted with the local beauties, and so begins to see and appreciate them himself. Other reasons, of course, spring from improved communications, more cash in circulation, and the many modern comforts of life, unknown in Arizona two decades ago.

Until a few years ago, summer camps, pleasure resorts, and country clubs hardly existed. To-day they multiply. Golf balls smack and whistle now where bullets used to fly.

Paved roads work wonders. To-day scenic regions long inaccessible are thrown open.

Few outsiders realize that more than half of Arizona's area lies from 3,000 to 5,000 feet or more above the sea. Stand anywhere and mountains are in sight.

Northeast of Phœnix is high, broken country, rough as the Alps or the Andes. Since time began, in parts of this hostile area human foot was never planted. Along the sides or bottoms of its winding canyons Apaches beat their hidden trails;

Photograph by Dr. Gilbert Grosvenor

SILVERY LAKES GLISTEN AMONG ONCE DRY AND EMPTY CANYONS

Men used to die of thirst in parts of Arizona where water is now plentiful all the year. This happier condition is achieved by great storage dams, artificial lakes, and growing networks of canals. Besides aiding irrigation and creating electric power, these blue inland seas, set among rugged hills, afford swimming, fishing, and boating pleasures to a rapidly increasing population.

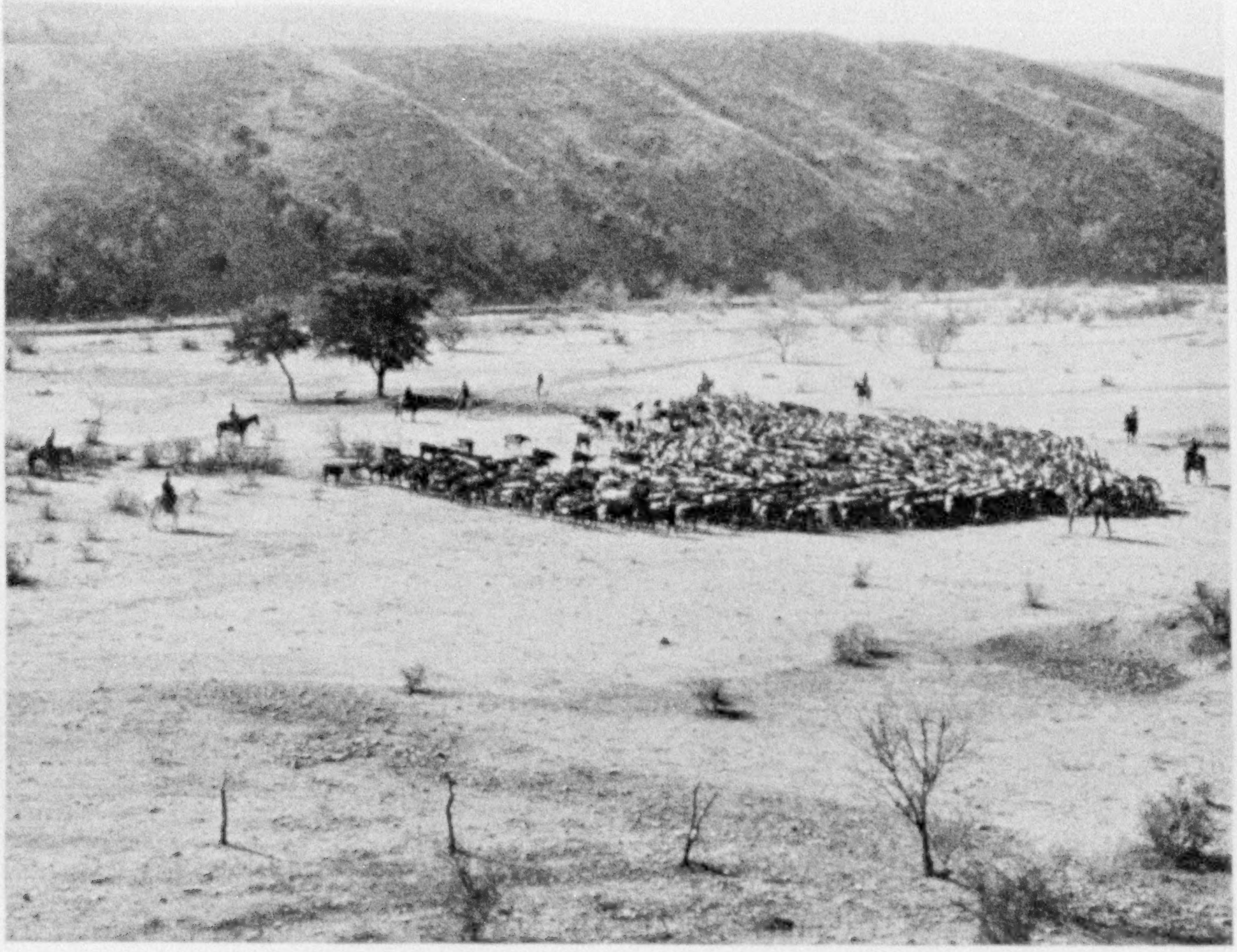
Indian guides, prospectors, and packers used the more passable of these.

But until modern irrigation came few whites saw this region. Now big storage dams, reached by scenic motor drives, form lakes as beautiful as any in Switzerland.

Lodges and summer camps arise and pleasure craft dot the lakes, as Arizonians come to fish for bass in clear, cool water 200 feet deep, over a once dry, rocky gorge peopled by owls, rattlesnakes, and coyotes.

Douglas, Tucson, Florence, Phœnix—all these are built on flat, hot plains; yet from any one, in two or three hours, one may now motor to high, cool altitudes. Roads and motors change the habits and economic position of the whole State.

One of the highest bridges in the world has been completed recently across the Grand Canyon. One hundred thirty-five miles north of Flagstaff this dizzy structure spans the Colorado. It eliminates the old river crossing, known as Lees Ferry, six miles above its site. Until now the only vehicular way through the Canyon was down a narrow, dangerous mountain road that hugged the face of bluffs, to reach



Photograph by Clifton Adams

MEXICAN BEEF CATTLE NEAR NOGALES, ABOUT TO CROSS THE "LINE" INTO ARIZONA

Many cattle from Sonora ranges are brought over into Arizona to be fattened and marketed in the States. This herd is being held for counting and inspection by U. S. customs and veterinary officials.

Lees Ferry, set up long ago by Mormons migrating to Arizona from Utah. Except the Mormons, Indians, traders, and trappers, very few travelers have ever passed this way.

Yet this path leads through a region of astounding and rugged beauty. From Flagstaff north it crosses the flaming Painted Desert; then, over the bridge hung like a giant steel spider web spun between precipitous canyon cliffs, past Bryce Canyon, into the Kaibab National Forest and Zion National Park.*

Through countless centuries, until this bridge was built, the great gorge barred man from travel north and south (p. 45).

In all the United States there were no two post offices "so near and yet so far" apart as those on opposite sides of the Grand Canyon of Arizona before this bridge was built. It is only about 11 miles by air line from the post office at Grand Canyon Station, Arizona, on the south rim, to Kaibab Forest Station, on the north rim. Yet, because it was quicker, mail, before the bridge opened, was sent via California, Nevada, through Utah, down to Cedar, and thence 170 miles by stage, or *vice versa*, between these post offices, a distance of 1,025 miles, though one station

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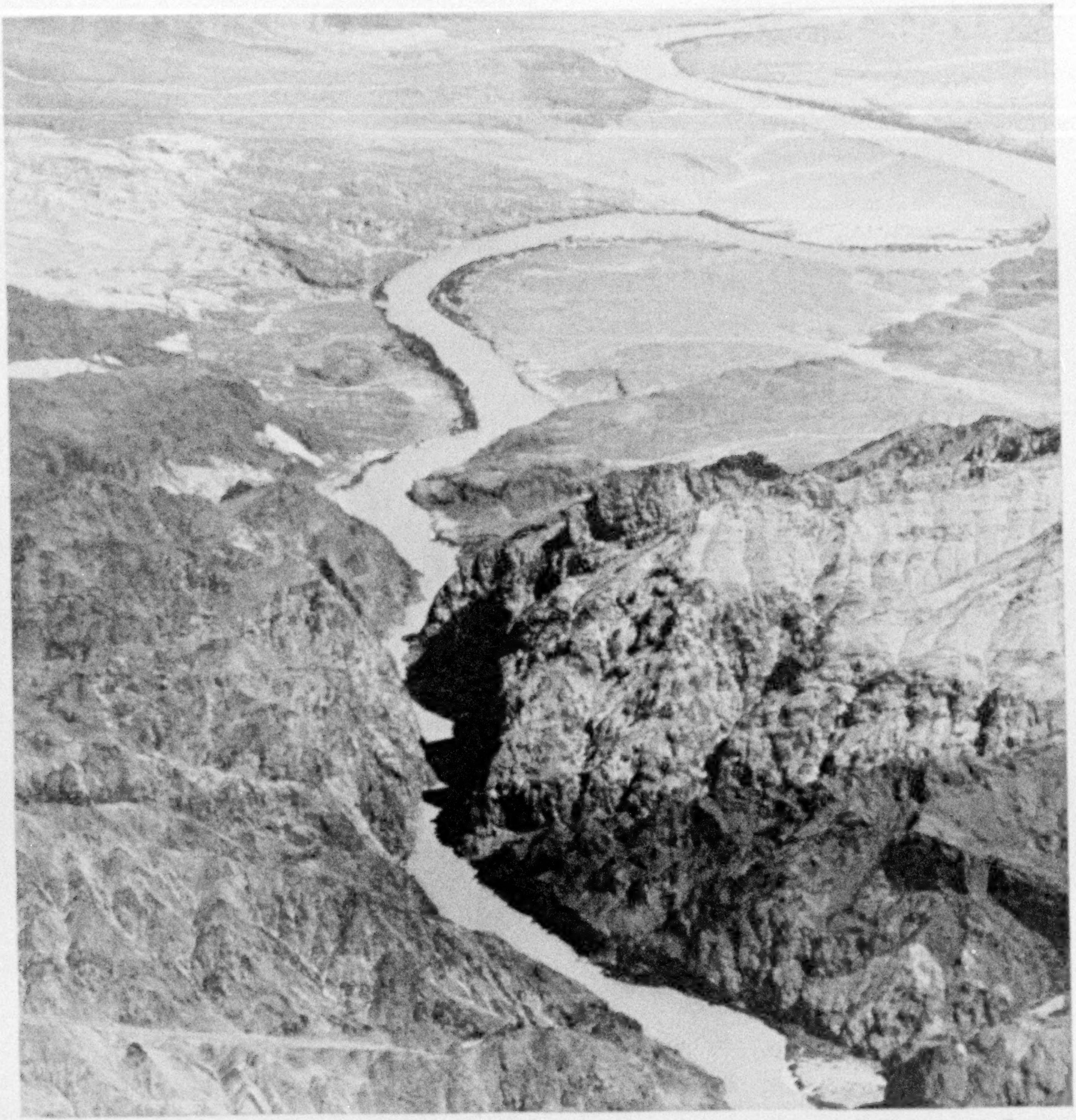
* See, also, "Photographing the Marvels of the West in Colors," by Fred Payne Clatworthy, in the NATIONAL GEOGRAPHIC MAGAZINE for June, 1928.



Official Photograph, U. S. Army Air Corps

TO CONTROL COLORADO RIVER FLOODS, DEVELOP POWER, AND WATER MORE FIELDS, A DAM IS PLANNED IN BOULDER CANYON

All the seven States of the Colorado River Basin are deeply interested in the project to dam this stream, either at Boulder or Black Canyon. This aërial view of Boulder Canyon shows the proposed dam site and, in the upper portion, the huge basin, which would hold an artificial lake 100 miles long. One benefit from such a dam would be flood protection for the vast, rich Imperial Valley of California.

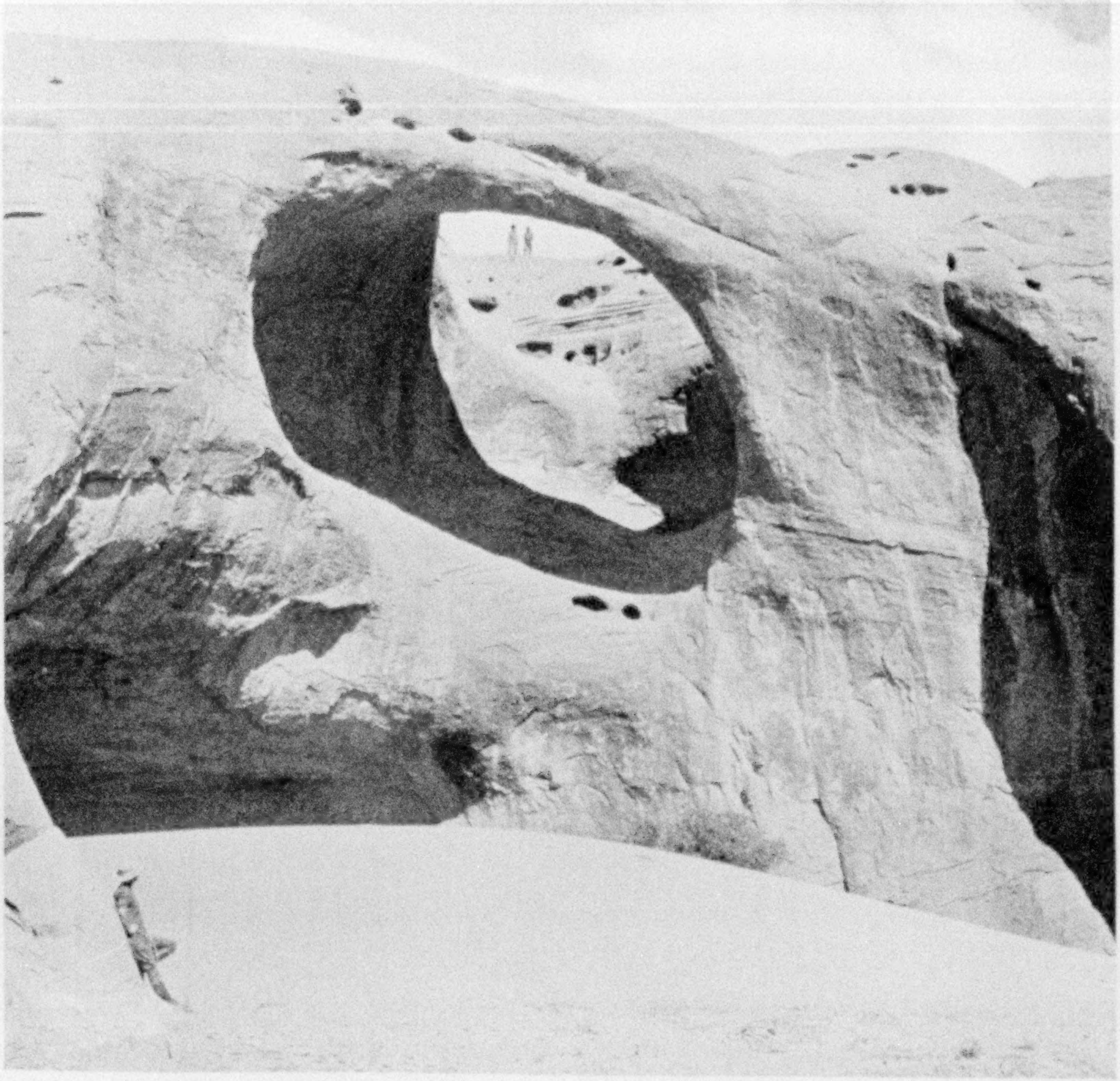
can be seen from the other through field glasses!

No two cities on our continent have been more widely separated than Phœnix and Salt Lake. Now, north and south, from Salt Lake to the Mexican border, another great channel is open to tourist traffic, and increasing thousands will use it.

The astonishing story of prehistoric man in Arizona is graphically revealed in the University Museum at Tucson.

On view there are the actual clothing, implements, utensils, weapons, and jewelry used by cliff dwellers and other forgotten people (see, also, page 21).

In her treasure-hunting, Indian-fighting, wild-oats age, Arizona took no thought of archeology. She dug for gold, not for bones, beads, or broken pots. Now it is different. She has grown conscious, and proud. So she repairs and restores the cliff dwellings and the *casas grandes,* and



Photograph by Edwin L. Wisherd

AS IF A PLAYFUL GIANT HAD POKED HIS FINGER THROUGH A HILL: MONUMENT VALLEY

In and about the Grand Canyon country, oddly carved rocks, often startling or grotesque in formation, reveal what pranks of sculpture Nature may play.

archeologists who delve into her ruins are no longer permitted to ship all their finds to museums back East.

"We are grateful for aid in the study of our amazing archeology," said one Arizonian, "and we are willing to divide our excavated relics of antiquity with those from the East, but unless we check their speed a bit the day will come when there won't be a skeleton, a stone ax, or prehistoric bean pot left in the State."

Until Crook and Miles caught Geronimo, most news from Arizona told only of Indian raids. Now that scalps are safe, interest in Lo is low. But not among tourists.

"I sell more pictures of Indians than of anything else," a Phœnix post-card vender confides.

Time turns back among the Navajos until one sees life as in Montezuma's day. Small girls parch corn over fragrant juniper fires. Boys, their black hair held back by broad red headbands, tend the goats or gallop about the hogans on their bareback pintos. At handlooms women are weaving. They spin and dye wool, make rugs, and sell to the traders, not for cash, but in return for goods from the traders' country stores.

Among the treeclad hills men and boys gather piñon nuts or drag in firewood with a horse and a rope.

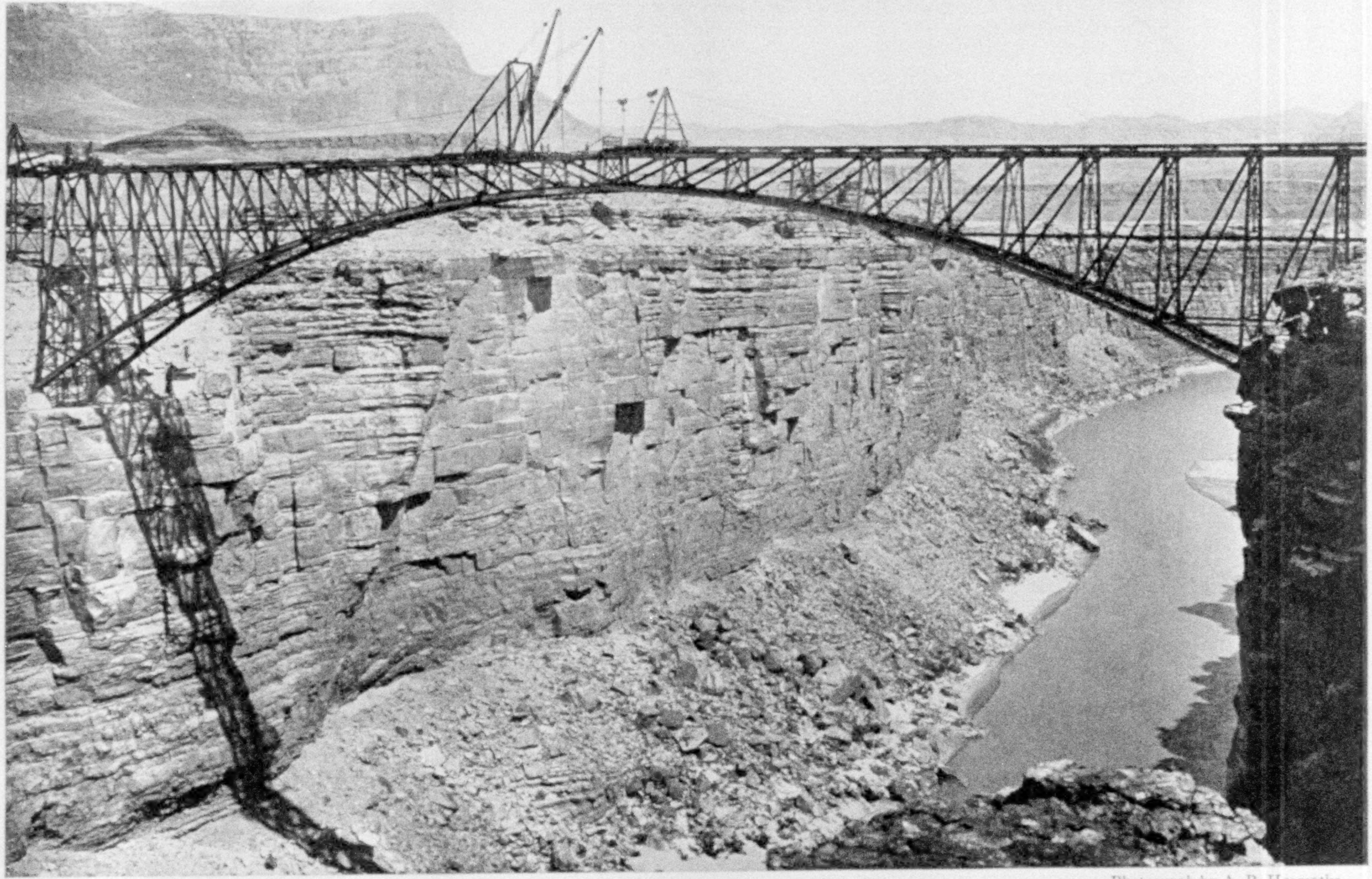
ARIZONA COEDS SAVE THEIR CHICKEN BONES FOR THIS PET

This bobcat, Agamemnon—"Aggy" for short—has tufted ears, blue eyes, and padded paws. When in happy mood, he purrs like a domestic cat (see text, page 37).

Photographs by Clifton Adams

COSTUMES OF MEXICO ARE FAMILIAR TO ARIZONA BORDER TOWNS

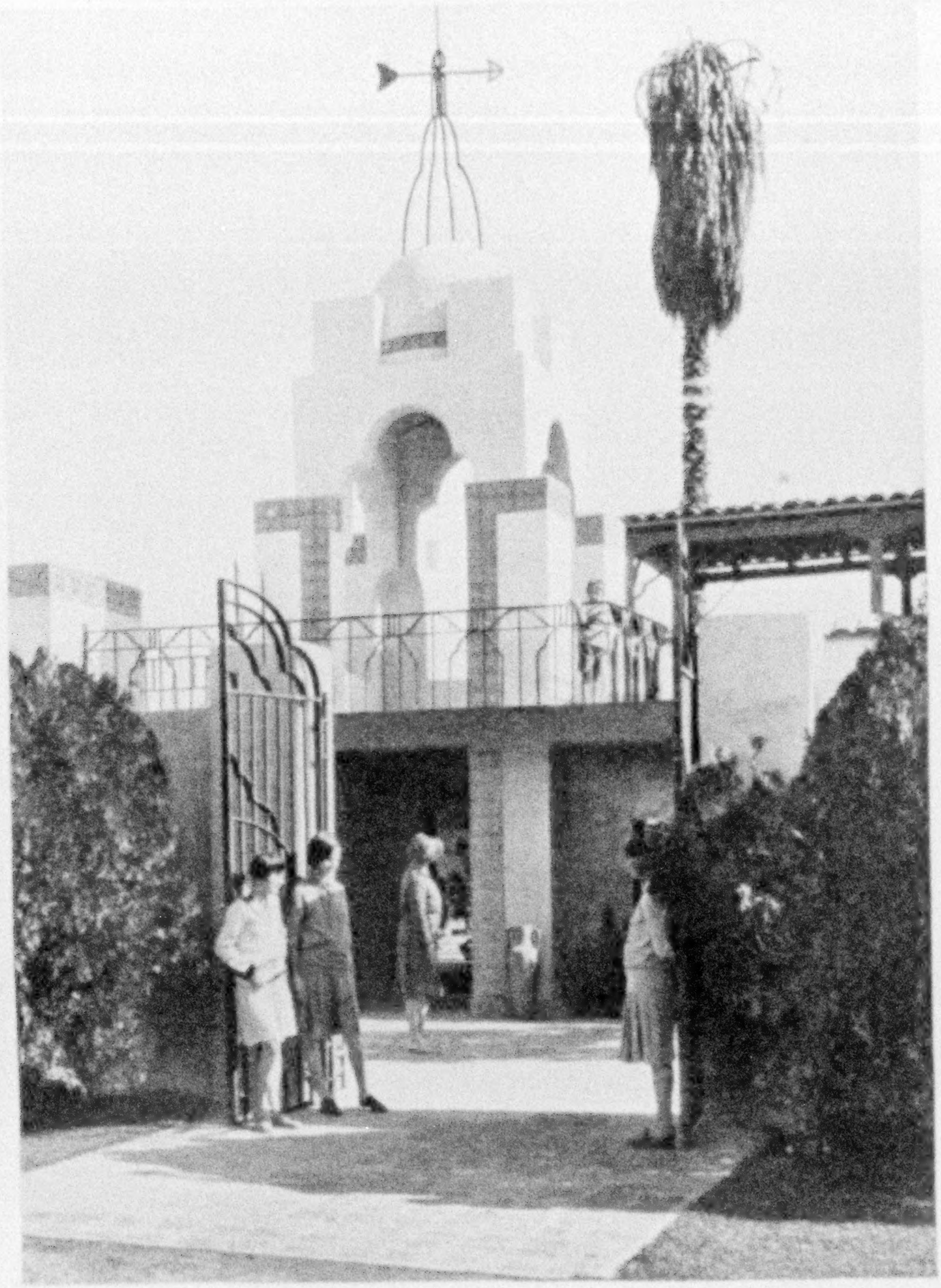
Bright-flowered Spanish shawls and high-backed combs are favorite attire and are popular with girls of both races on fiesta days. An Arizona belle of Nogales.



Photograph by A. R. Hromatka

THIS AWESOME CHASM YIELDS AT LAST TO ENGINEERING SKILL

The new highway bridge across the Grand Canyon opens north-and-south travel between Utah and Arizona. Over it men and goods move freely now, between busy, populous regions formerly separated by the great abyss. The bridge, among the world's highest, dizzily spans the stone-walled gorge at a point about 135 miles north of Flagstaff, Arizona. Its two parts were joined 475 feet above the turbulent Colorado River. One half of the arch was completed before the other was started. From the end of the completed half a cable car was operated to the opposite rim, hauling men and materials. This was necessary because there was no other satisfactory means of conveying the heavy pieces of steel to the north rim.



Photograph by Clifton Adams

ONE OF MANY BEAUTIFUL HOMES OF SPANISH ARCHITECTURE IN PHŒNIX

"Where does that music come from?" I asked him.

"They say Los Angeles. I don't know. When a cow bawls, the music comes from the cow. It's a long ways to Los Angeles."

I talked with a young woman. I asked her where she learned English.

"At school in California," she said.

"What did they teach you?"

"To make beds, wait on table, and sing 'America'."

"Were you glad to go off the reservation to school?"

"Yes. But I wanted to learn dressmaking and get a job in Los Angeles. I was out there eight years. It's hard now to come back here, after being in school that long. I don't want to herd goats and live in a dirt house and sleep on the ground."

The problem of the returned Indian student is an American sociological riddle.

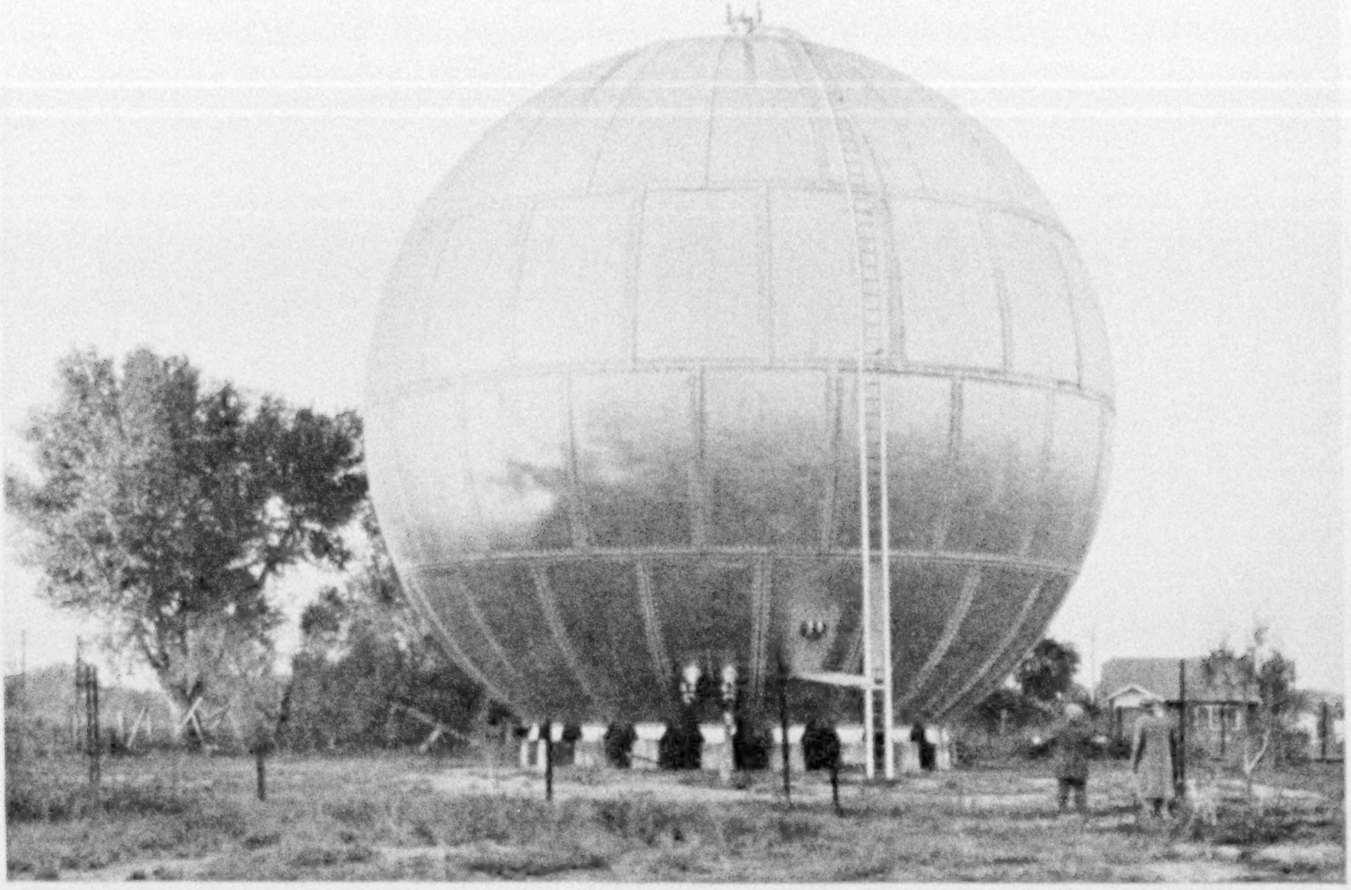
A hard, wind-bitten, horse-loving race, these men are; mindful always of a good bargain; not above robbing the pack rat's nest of his odoriferous winter hoard of piñon nuts, sold East later by traders at $15 a bag.

Passing out new steel traps, or tobacco, sugar, and coffee for skins of wild animals, or baskets, blankets, and Indian jewelry, these reservation trading posts bring back thoughts of pioneer days. But not for long. Radio jazz music and the drag and thump of cowboy boots rising in the trader's dining room back of his store hinted at a party. I went back. Juniper blazed in a fireplace built of petrified logs from the Petrified Forest. Beside it an Indian boy cleaned his rabbit rifle.

Arizona has more than 46,000 Indians—Pimas, Apaches, Navajos, Hopis, Maricopas, Papagos. Some, as the Pimas, are settled farmers. Navajos have big herds; they export cattle, sheep, and some horses. Apaches work about mines, sawmills, and on road construction.

Quitting the Painted Desert, we went west, past a spot on the plateau where flat stones are covered with dinosaur tracks. Beside the three-toed footprints of a big dinosaur I saw tiny tracks of a smaller one (see page 13).

The sun was setting. As if from a giant paint brush in God's own hand, mile-long beams of brilliant colors splashed across the sky. I thought of some other sunset, thirty million years ago, when that



Photograph by Clifton Adams

A SPHERICAL GAS TANK IN PHŒNIX, DESIGNED TO EQUALIZE THE PRESSURE FOR OUTLYING DISTRICTS

This unique container is 60 feet in diameter and holds 300,000 cubic feet of gas. It has been proposed by some geographically-minded citizens of the capital that a huge map of the world be painted on its sides.

baby dinosaur went skipping and crying after its colossal mother in the cool of an evening when the world was young and these hard rocks were mud. Now empty cans are rusting, and flivver wrecks mark the trail of men among the dinosaur tracks, and idlers copy them in red paint on garage walls.

THE MEXICAN HAS BEEN ARIZONA'S CHORE BOY

In the last decade Arizona's population has increased faster than that of any other State. To the increasing arrival of Mexicans this is partly due, and in Arizona's rise from a wilderness to a more populous, prosperous place, most of the manual work has been done by Mexicans.

Yet, useful as they are economically, their steady increase presents a sociological riddle. They and her 46,000 Indians have retarded the State's social progress. From laboring classes in Wisconsin or New York often spring our best minds; but few recruits for leadership in finance, education, or the professions come from the Mexican or Indian population of our Southwest.

Most of Arizona's cultured class, such as her lawyers, doctors, journalists, and engineers, are still imported. This cultural leadership, drawn from diverse places, frees the Commonwealth from the crowd thinking of older communities and endows it with a certain intellectual nonconformity. Precedents dismay it not at all.

Swift, kaleidoscopic, full of action; the whole fascinating gamut of civilization, from stone ax to etcher's needle—that is Arizona's story. Cliff men fighting with spears in her youth; Spaniards in coats of mail, and bearded Yankees with traps or gold pans; cowboys, apt with Colt, cards, or noose. Tourists now, instead of trappers; book agents, after road agents. Automobiles parking where yesterday horses stamped flies at hitchracks before a trader's corner store and saloon. "Hitchrack," "buggy," "beaver trap," "saloon," "six-gun"—fading words now, as Arizona grows up.

ONE OF THE ECUADOR EXPEDITION BOYS PAUSES TO REFLECT

Most of Ecuador's civilized Indians are of the Quichua tribe. They are a hardy race and capable of prolonged exertion, with little rest or nourishment. Under their mask of stolidity there are latent abilities, for members of their race have risen, under favorable circumstances, to high places in the country. The admixture of Indian and white blood has produced a half-caste people known as Cholos.

THE VOLCANOES OF ECUADOR, GUIDEPOSTS IN CROSSING SOUTH AMERICA

BY G. M. DYOTT

AUTHOR OF "ON THE TRAIL OF THE UNKNOWN" AND "SILENT HIGHWAYS OF THE JUNGLE"

With Illustrations from Photographs by the Author

FEW parts of South America afford such interesting opportunities for observation and research by the casual or scientific traveler as Ecuador.

This republic, astride the Equator, is a country of extremes; no matter what branch of science one follows, there is something to arrest attention at every turn. From the topmost pinnacles of its ice-clad peaks down to the very grass roots of the sweltering jungles can be found things out of the ordinary.

It may seem superfluous to touch on the cultured life found in the larger cities of Ecuador; yet, in an article which deals largely with unmapped regions, Indians, and nameless rivers, the average reader might well assume that the country is populated entirely with savages, losing sight of the fact that there are centers of learning and intellectual development second to none on the South American Continent. In all my wanderings I found the Ecuadorians extraordinarily courteous to the stranger, and it is a pleasure to recall the friendly hospitality extended to me, both by rich and poor.

SANGAY, THE FLAMING TERROR OF THE ANDES

The first object of my search was the great volcano of Sangay, described by Dr. Teodoro Wolf in 1892 as one of the most active volcanoes in the world. It was in the delightful mountain town of Riobamba that my companion, G. C. Johnston, of London, and I began our inquiries concerning it.

We arrived by train from Guayaquil, on the coast, and took up our abode at the comfortable Hotel Metropolitano. A week was spent in fruitless inquiries as to the best way of approaching our goal; for Sangay, although one of the most formidable, is also one of the least known of all the large assortment of volcanoes for which Ecuador is famous.

We might well have been hunting for the lost treasure of El Dorado, so vague were the stories told us. Everyone had heard of the "flaming terror" to the east of the Andes, but no one had ever ventured near it. Within several leagues of its base (so ran the tale) were lakes whose waters spouted high in the air, drenching the country for miles around and forming a regular water barrage; then, like the dragon of old, with seven heads, Sangay was reported to have seven craters which one at a time belched forth fire and destruction.

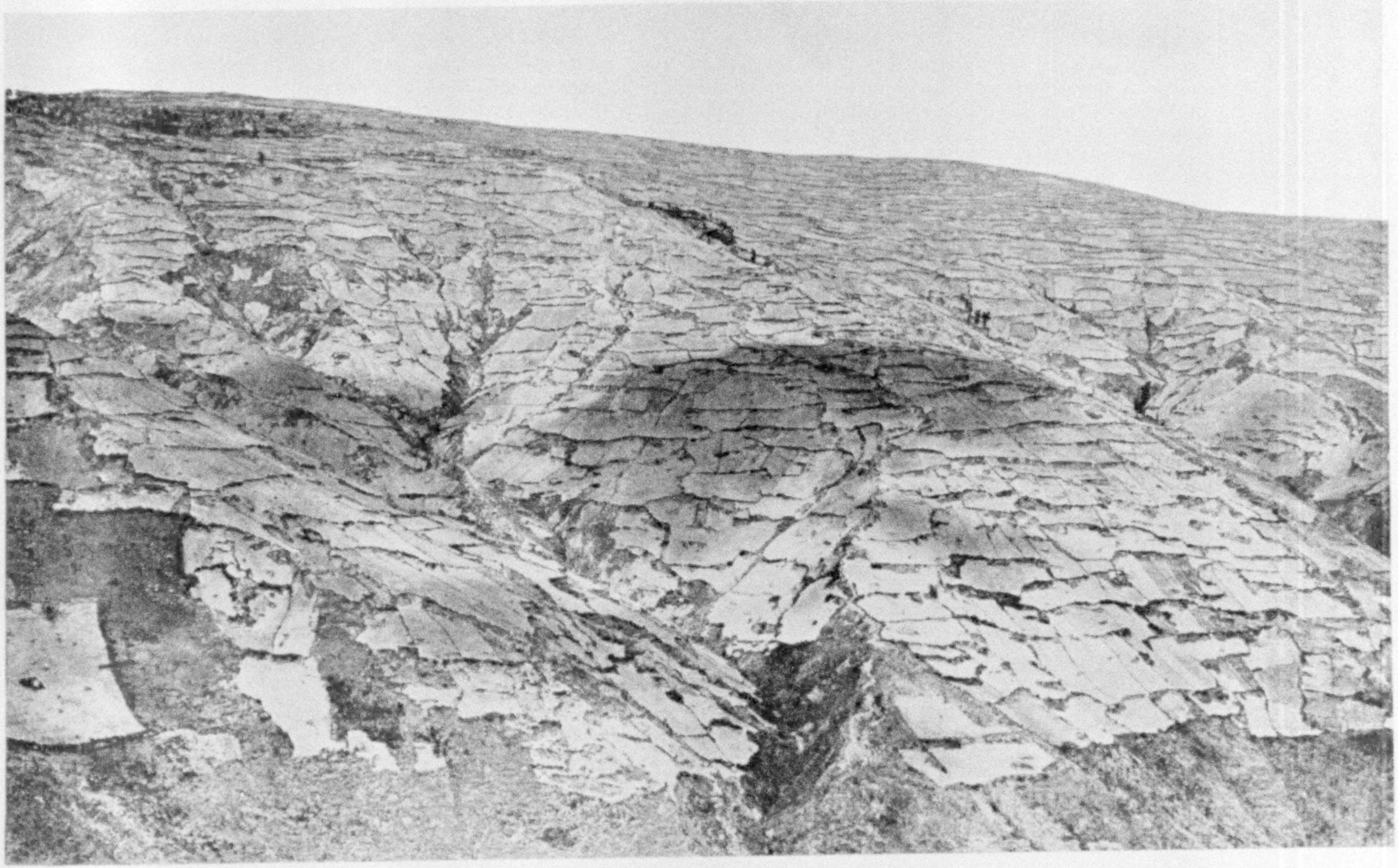
Last, but not least, there were stories of earthquakes of such violence and frequency that it was physically impossible to stand erect in the vicinity of the volcano, and the only means of locomotion was to crawl about on all fours, like the beasts of the field.

THE PROBABLE "OWNER" OF SANGAY VOLCANO PRESENTS HIMSELF

Ten days after our arrival our servant came hurrying to tell us that a certain Señor Miguel Merino was inquiring for us in the lobby of the hotel. A well-dressed man introduced himself and, after the usual exchange of polite phrases, told us that he had heard of our desire to explore the slopes of Sangay.

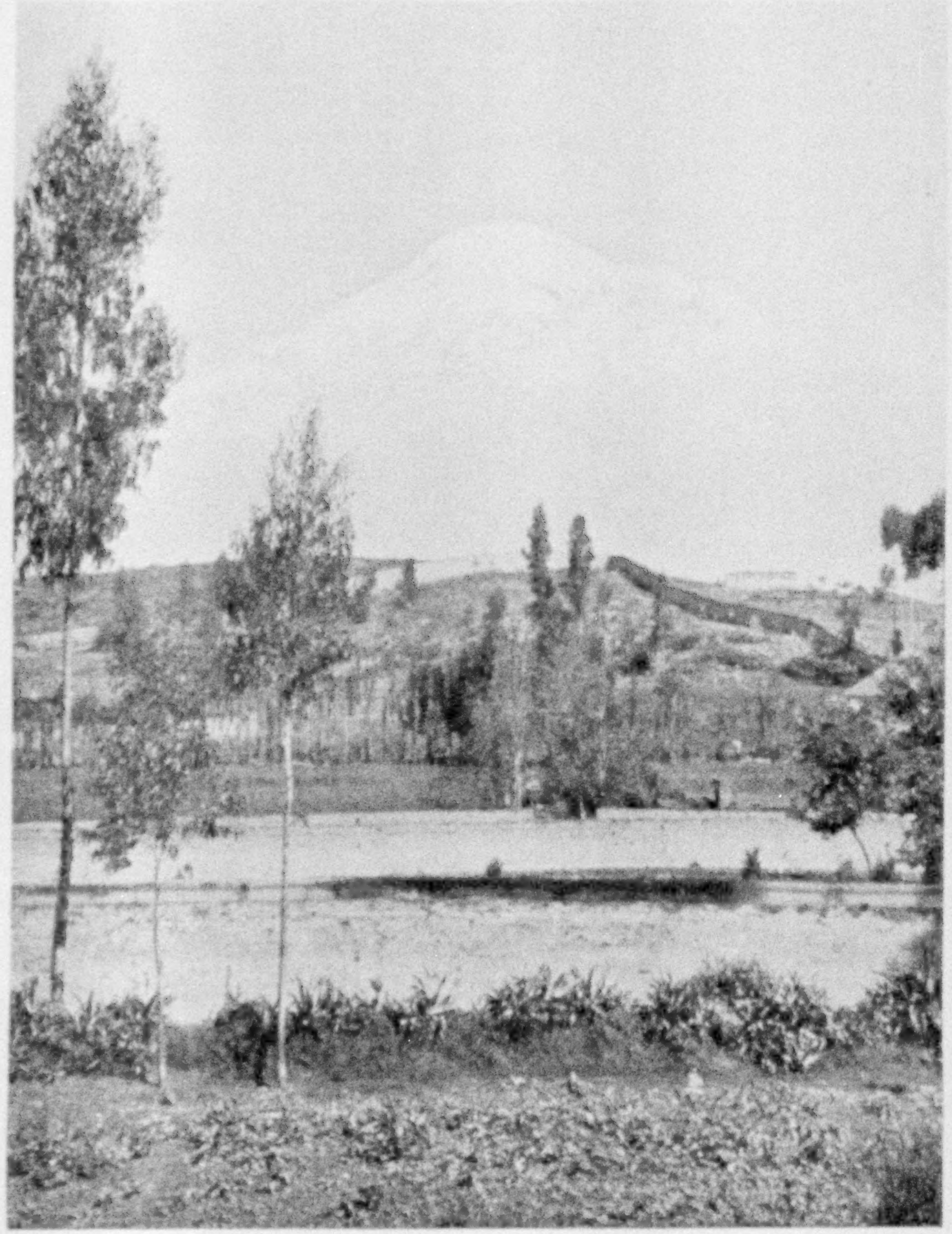
He explained that he was the owner of Alao, a little farm, the most easterly boundary of which lay to the east of the Andes, in the general direction in which we would have to travel. He spoke about this farm most casually, although we understood it covered several hundred square miles of country. He even intimated that Sangay probably belonged to him. He was not quite sure on this point, as his land had never been surveyed; in fact, no one had ever explored much beyond the most easterly ridge of the Andes, which formed a veritable backbone running through the center of his estate.

We learned that Don Miguel had actually seen Sangay on one occasion when out with his employees rounding up cattle. At the time, he was encamped in a grassy



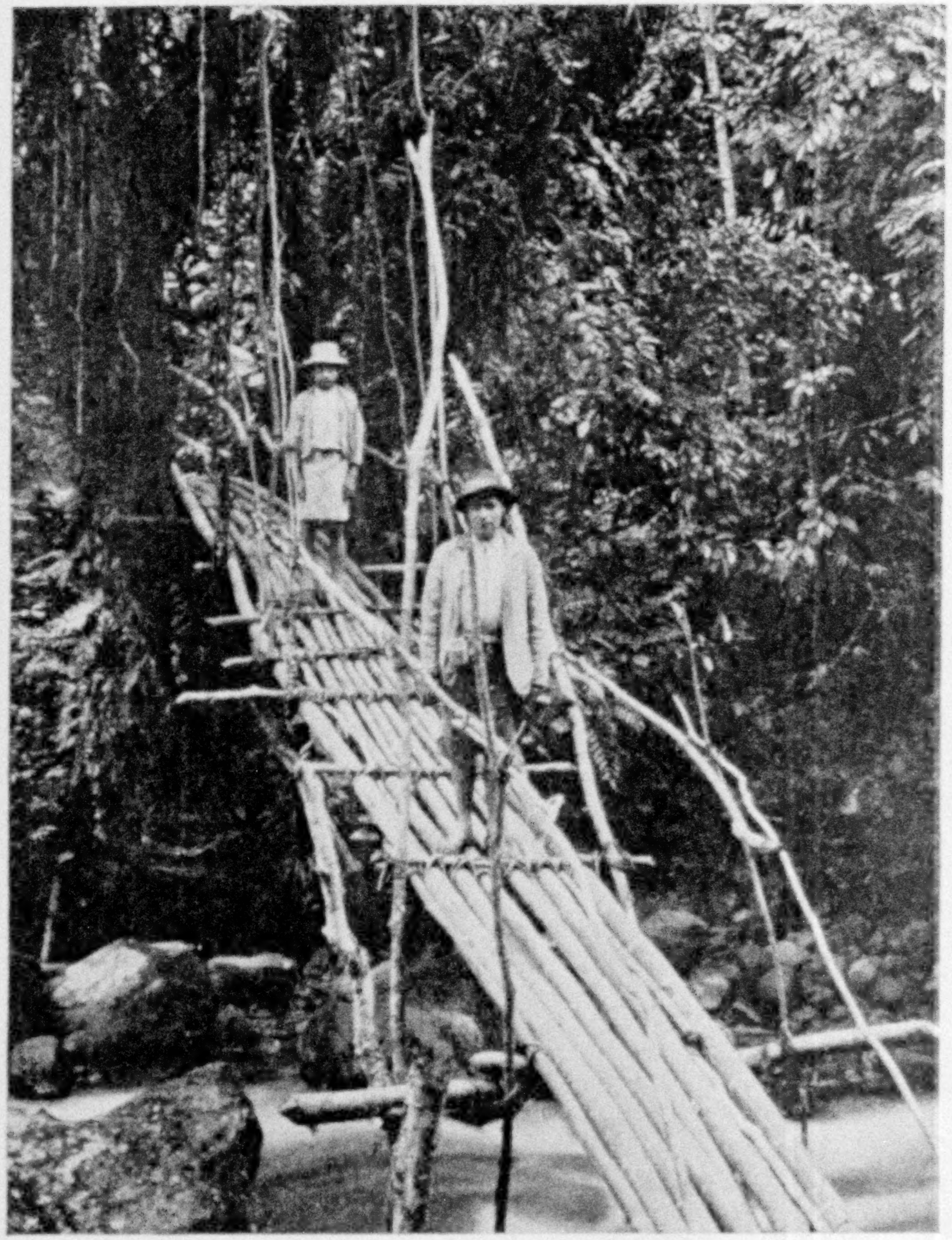
THE AGRICULTURAL METHODS OF THE INCAS ARE STILL IN VOGUE AMONG THEIR DESCENDANTS

On the steep slopes of the Andes, surface rocks are collected and built up into retaining walls, and on the numerous small patches of tillable ground thus created the Indians cultivate their crops.



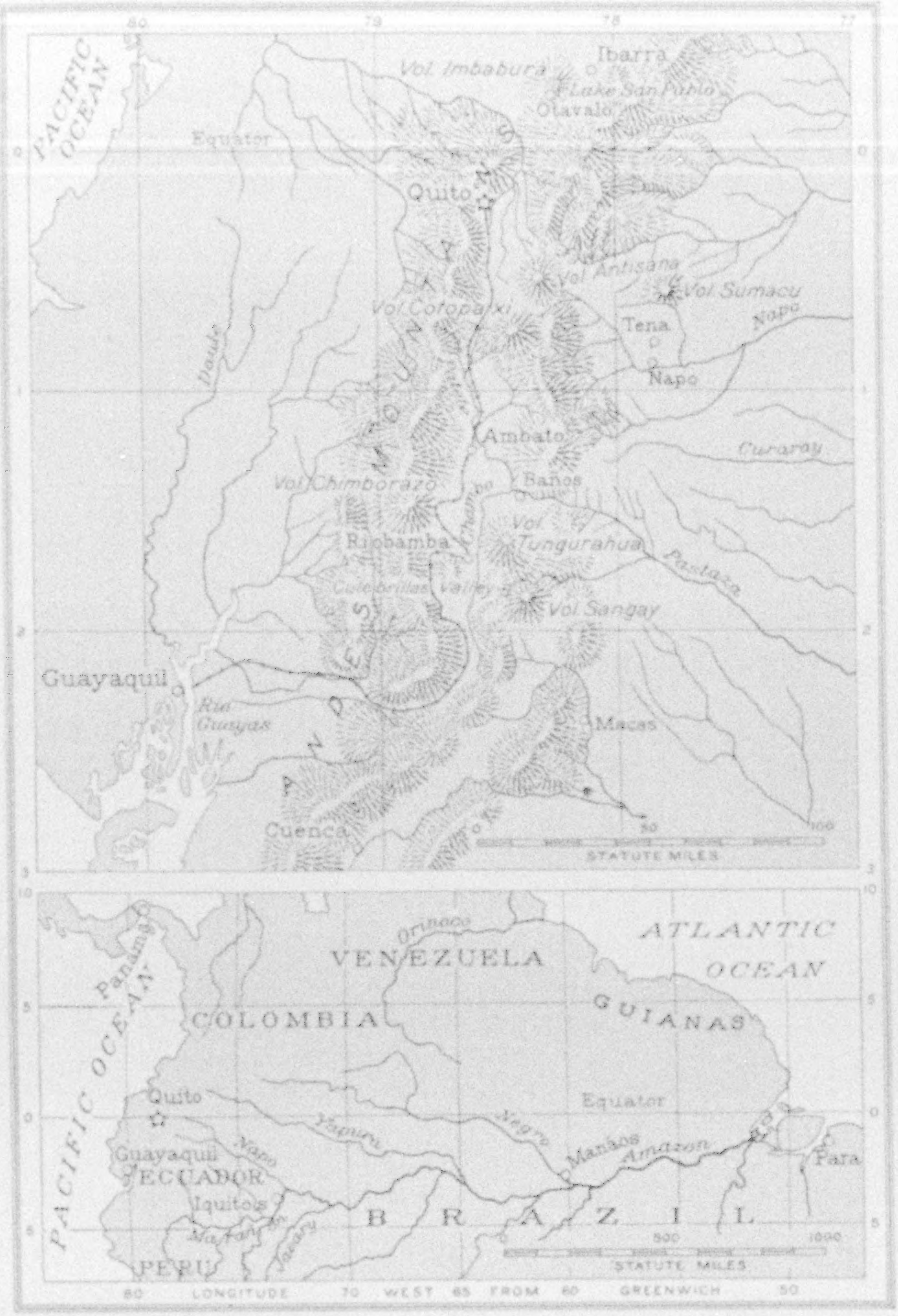
CHIMBORAZO IS THE HIGHEST PEAK IN ECUADOR

Rearing its snow-capped bulk to a height of more than 20,000 feet, this mountain is the outstanding spectacle of the scenery about Riobamba. It was first climbed by the British scientist Whymper nearly fifty years ago.



A PRIMITIVE SUSPENSION BRIDGE OVER A TURBULENT STREAM

With the exception of one post, the bridge is suspended from the growing vines that hang from the tree tops and from forest giants that lean out across the foaming waters.


PACIFIC OCEAN
Vol. Imbabura
Ibarra
Lake San Pablo
Olavalo
Equator
Quito
Vol. Antisana
Vol. Sumacu
Napo
Tena
Napo
Vol. Cotopaxi
Daule
Ambato
Curaray
Vol. Chimborazo
Baños
Chambo
Riobamba
Vol. Tungurahua
Pastaza
Culebrillas Valley
Vol. Sangay
ANDES
Guayaquil
Rio Guayas
Macas
Cuenca
STATUTE MILES
VENEZUELA
Orinoco
ATLANTIC OCEAN
COLOMBIA
GUIANAS
Panama
PACIFIC OCEAN
Quito
Equator
Yapura
Negro
Manaos
Amazon
Para
Guayaquil
Napo
ECUADOR
Iquitos
Marañon
Javary
B R A Z I L
PERU
STATUTE MILES
LONGITUDE 70 WEST 65 FROM 60 GREENWICH 50

Drawn by A. H. Bumstead

ECUADOR IS A LAND OF SNOWCLAD PEAKS, GRASSY PLAINS, AND TROPICAL JUNGLES

Nowhere else in the world are there so many peaks crowned with perpetual snow in so small an area. In one region there are 22 such symmetrical summits almost within sight of one another.

valley which he called Culebrillas, because down the center of it a large stream wriggled after the manner of an enormous snake. He related how the clouds had rolled back one evening, revealing the snow-white cone of this great volcano. He also informed us that beyond this valley no man had ever penetrated.

In true Ecuadorian style, Don Miguel extended to us the hospitality of his farmhouse, urged us to make it our headquarters, and told us that his overseer would be given instructions to aid us in every way possible. With the road pointed out, all that remained was for us to organize our transport and start.

WEARY WAYFARERS ARE HOSPITABLY RECEIVED

We traveled as far as the village of Licto in a Ford delivery wagon; thence up the valley of Alao on horseback. Hour after hour we rode, with no signs of Don Miguel's hacienda. From what had been told us, we should have been there easily at 4 o'clock. Rain and darkness overtook us, and we barely crawled along. After crossing a river, our horses stumbled into the patio of a ruined house — at least so we thought, for we could see nothing distinctly save vague outlines of trees and the profile of a crumbling wall. The jaded beasts stopped in a muddy court, as if to say that nothing would induce them to go farther.

We were debating what to do when a shaft of light suddenly shot forth from a doorway and a man, wrapped about with a poncho, stood silhouetted against the glare from within.

"How far is it to Alao?" we called.

"A full hour, and the trail is bad." The figure turned as if to shut the door. There were signs of hesitation, subdued conversation within, and once again the door opened wide. Then, in more friendly tone, "Would the señores care to spend the night under this humble roof; poor accommodation, but possibly better than continuing in the rain?"

Needless to say, we thankfully accepted the hospitality.

The following morning we reached our destination, a farmhouse typical of many in the high sierra. Here we waited a week for favorable weather, which failed to materialize. Finally, driven frantic with inactivity, we bade farewell to Don Miguel's farm and set out on a sweeping detour to the east, down into the forest country. There, propped up in tall trees or standing on some high bluff dominating the tropical jungles, we spent weeks studying the lay of the land.

A MOUNTAIN INDIAN BOY OF ECUADOR

Two months later Johnston and I once more drew rein in the patio of Alao; but the time which had elapsed since our first visit had not been lost. For days we had watched from some point of vantage and with powerful field glasses waited patiently for the materialization of Sangay out of a storm-troubled sky. Our only reward would be an occasional glimpse, and out of these fleeting visions we had to piece together a mental picture of 500 square miles of country, in the center of which stood the object of our search.

INDIANS LEND EAGER AID

We were fortunate in procuring the willing assistance of many mountain Indians living on Don Miguel's estate, and a few mornings after our second arrival the giant condors of the mountains looked down on a small army of human beings crawling up to the main backbone of the Andes like so many ants on the move. A light fall of snow from the night before still clung to the grass roots, and as the men were adjusting packs I scanned the crumpled part of the earth's crust that lay on the other side of the divide.

To my expectant senses the absence of Sangay from the landscape proved a keen disappointment. Only near-by ridges were visible; beyond was sheer chaos. Battalions of black clouds in mass formation were bearing down upon us, and before we began the descent hail and sleet were lashing our faces.

A night spent in the open, cold and wet, brought little comfort to our souls, but noon of the following day saw us snugly camped in an open valley, where another long period of waiting ensued, while snowstorms drove across the mountains, rain and mist hid everything from view, and Sangay seemed simply not to exist.

Patience brought its reward, however, and the veil was finally pulled aside, disclosing the mountain of our dreams in all its exquisite beauty. The clouds seemed

A BREATHING SPELL EN ROUTE TO SANGAY

The *páramos*, as the intermountain uplands of Ecuador are known, are treeless and covered with tufts of coarse, high grass. They are frequently swept by icy gales.

literally to dissolve, and from the top of a mound we watched the process, spellbound.

The base was the first to appear, and as the clouds rolled up to the summit, soaked in the rays of the setting sun, it looked like a giant's bonfire. As the Phœnix rose out of ashes, so Sangay materialized out of smoke, till it stood before us in bewildering and indescribable magnificence—a perfect cone, its culminating 2,000 feet clad in snow, flushed a faint pink against a violet sky.

The base, ribbed and scarred by the lava flows of centuries, stood out boldly in support of the whole, like the flying buttresses of a Gothic cathedral (see illustrations, pages 57 and 60).

For perfection of form, Sangay is in a class of its own. The lonely sentinel, detached from the main backbone of the Andes, thrusts its white head into the clouds to an elevation of 17,450 feet.

Within 36 hours our Goddess of the Snows had once more dissolved from view, but that one day of clear weather was enough to indicate that we must make a big detour in order to reach our destination.

GOOD LUCK GUIDES THE EXPEDITION'S FOOTSTEPS

Good luck more than good management guided our footsteps to our next main camp. We literally groped our way for-

FROM THE VALLEY OF ALAO THE AUTHOR SET OUT FOR MOUNT SANGAY

The house at which the expedition established its base was the administrative center of a "farm" embracing an area of several hundred square miles (see, also, text, page 49).

ward, sometimes following a spur ridge that would lead us on hopefully through the mists for a time and then without warning slide off into space. We would stare disappointedly at the gray emptiness confronting us and slowly retrace our steps. Many such blind leads were followed, but ultimately we reached a small plateau—a high escarpment dropping off almost vertically at our feet—and straight in front of us, to the northeast, stood Sangay.

We looked out upon a deep valley traversed by countless streams which flowed between razorlike ridges. For the first time we saw the actual base of this great volcano. Far below waved the green *páramo* grass patched with darker green of shrub and bush; upward lay the yellow greens of moss streaked with the silver gray of landslides. Higher still came the cinder zone, a mass of chocolate brown shading off into purple sepia and broken by the glint of glacier or the dark shadows of barren rock.

Firmly planted on this pile of superb coloring rested the great snow-white cone itself, capped with a jet-black crown of irregular contour. From the topmost pinnacle rose a column of steam caught in a shaft of sunlight, bending in the wind and gleaming like the Shah of Persia's diamond plume.

We pitched camp on this fascinating

GETTING THE LAY OF THE LAND

A vast amount of reconnoitering was necessary before the author found a way to ascend Mount Sangay. One of his observation points was a small plateau, much exposed to the weather. Here a lean-to proved too drafty, and his Indian boys constructed this "beehive" type of hut, which was warm and snug within.

spot and turned it into a main depot for our food supplies. Although we were still some distance from Sangay, we were able to make a detailed study of its steep sides when the clouds lifted in the evening, and we selected a satisfactory route for our climb.

Bad weather, as usual, hampered our movements, and we began to realize that there was some foundation for the stories told us in Riobamba of waterspouts drenching the countryside. Day after day there was a continual downpour of rain, with only fleeting spells of moderate weather.

The day we moved to a site selected for a camp at the base of the cinder cone we reached our new quarters at 4 in the afternoon. It was too late to complete our shelters, and we lay on the wet grass that night at an elevation of 13,500 feet.

THE FIRST ATTEMPT AT AN ASCENT

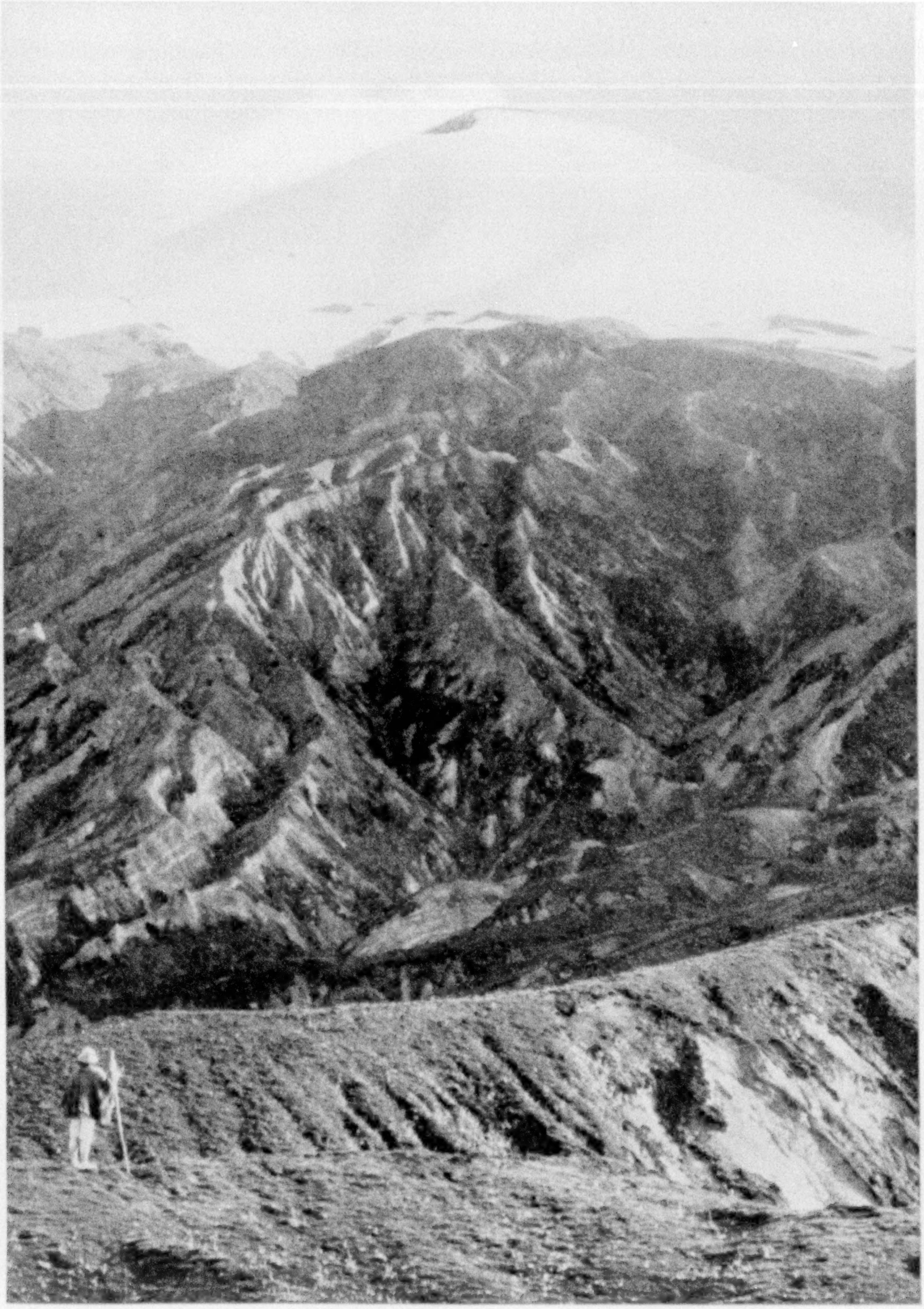
After the usual delays, we chose a moderately fine morning for our first ascent. Johnston remained in camp and I took two of our energetic followers to assist me in making a trail up to the snow line, with the intention of returning for breakfast at 9 o'clock.

Before the daily rains had started, we set out over ridges indescribably steep. We had frequently to level off the crest of a ridge in order to retain a foothold on it.

The temperature fell appreciably when we encountered our first glacier and had to walk alongside it; but our observations had been carefully made, and it was only after two hours of climbing that we were brought to a standstill on the edge of the snowfield.

Below us was a vast sea of clouds and round about hung a thin mist, without a breath of air to stir it. So eminently satisfactory had been our effort to reach the snow that I was tempted to go still farther and see what more could be accomplished. I had no smoked glasses, but absence of the sun made them hardly necessary.

Up to this point the boys had been in advance, making footholds with their crude implements. Now the tables were turned,



A COLLAR OF SNOW ADORNS "THE FLAMING TERROR OF THE ANDES"

Mount Sangay, once one of the world's most active volcanoes, rises to an elevation of more than 17,000 feet and the crater at its summit is collared with snow. The majestic peak stands solitary guard over a vast area of uninhabited territory. This photograph, showing the cinder ridges leading to the summit, was taken at a point where all vegetation ceased.

THE END OF THE TRAIL FOR BAREFOOT CLIMBERS

The Indian boys who accompanied the author on his ascent of Mount Sangay wore no shoes, and in consequence decided that the edge of the snow field was as far as they cared to go (see text, page 64).

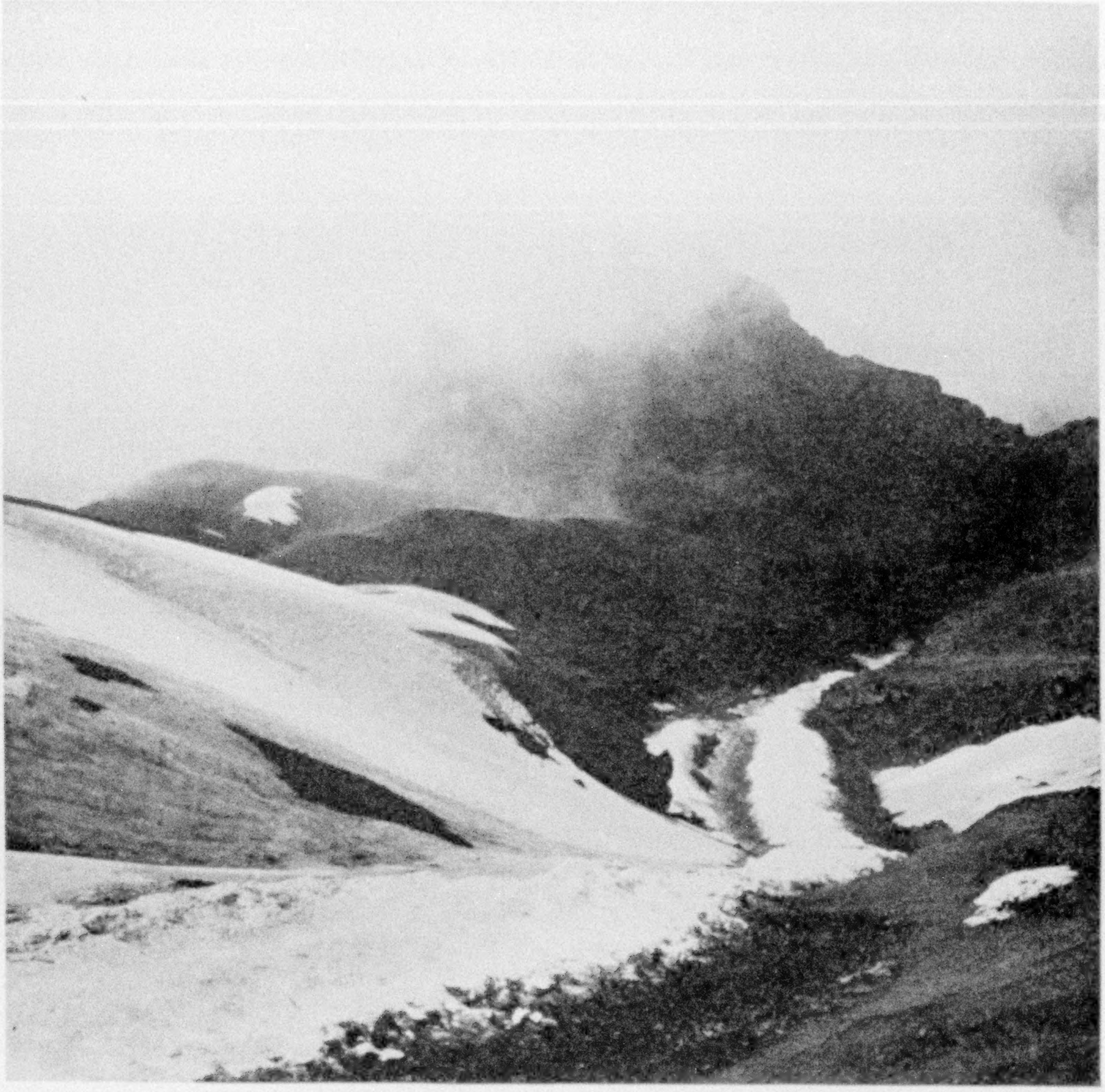
for they were ignorant about making trails in snow and the path to follow was far from obvious. Taking the lead, I would tamp the snow with one foot about twelve times, until it became sufficiently solid to bear my weight; then with the other foot I would tamp another spot farther ahead, until it likewise was sufficiently firm for me to stand on. Thus, step by step, very laboriously, very slowly, we ascended.

A MARVELOUS, NOISELESS WORLD

As we climbed, the snow became softer and deeper. What a strange sensation it was to be in a noiseless world! From time to time, to reassure myself of my own reality, I glanced back at the dark figures of the boys huddled up in their blankets.

The muscles in my legs were the first to tire; they were played out, with so much pounding on the snow. I now found it difficult to lift my feet unaided, and began to grip my knees with my hands and to use the muscles of my arms in raising them.

We were three miles up in the air when a strong easterly wind sprang up and drove every cloud out of the sky. It was a cold blast, one that had a bite in it. For a few moments I stopped to draw breath and look about. We were within 600 feet of our goal, a matter of 15 minutes.



INNUMERABLE GLACIERS STREAK THE SLOPES OF SANGAY

The mass of rock covered in mist is the point at which the slope of the mountain is joined to the main backbone of the Andes by a small transverse ridge. It was along this ridge that the author's party found an avenue of approach to the volcano.

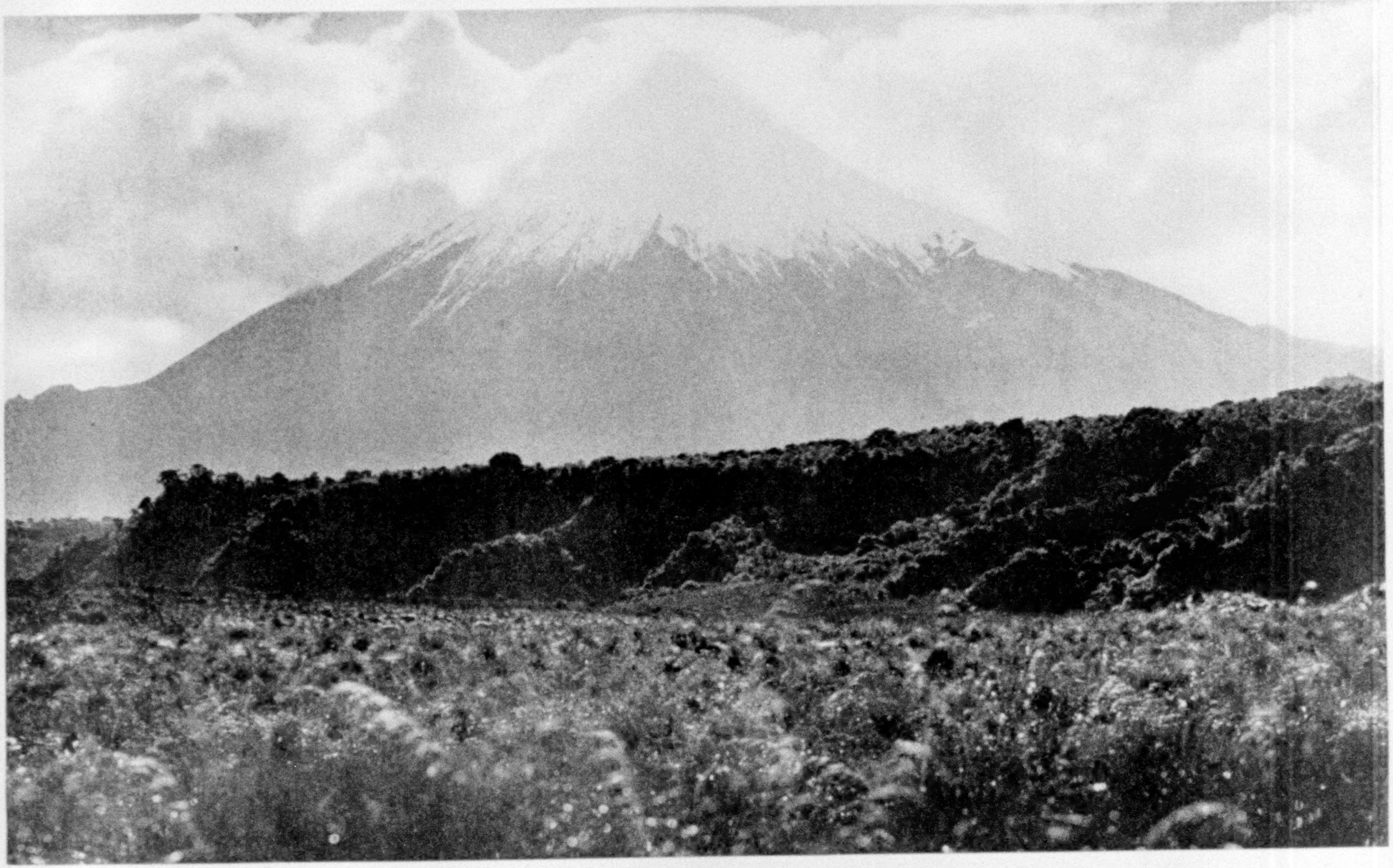
The glare was terrific, not only from above, but from the snow at our feet. The very air itself seemed to sparkle and scintillate. A tumbled mass of storm clouds lay over the country below, but their upper surfaces shone like quicksilver. No matter where we looked, we were blinded by the dazzling light.

Suddenly I was conscious of voices behind me—strange, unearthly voices they seemed. What were they saying? "Patron"—that was it. "Patron," and then, in piteous, imploring tones, "patroncito, we are dying; we are so cold, patroncito. Let us go back. To-morrow we will come up with you to the top."

Each moment the light became more blinding; so reluctantly, I gave the word to turn about. My companions needed no urging; but the rapid descent which I had figured on did not materialize. Coming up was child's play in comparison to the hard work of getting down, as the snow gave way at every step. For two hours we fought every inch of our way back, blinded by the light, exhausted by the unending struggle to get free of the snow.

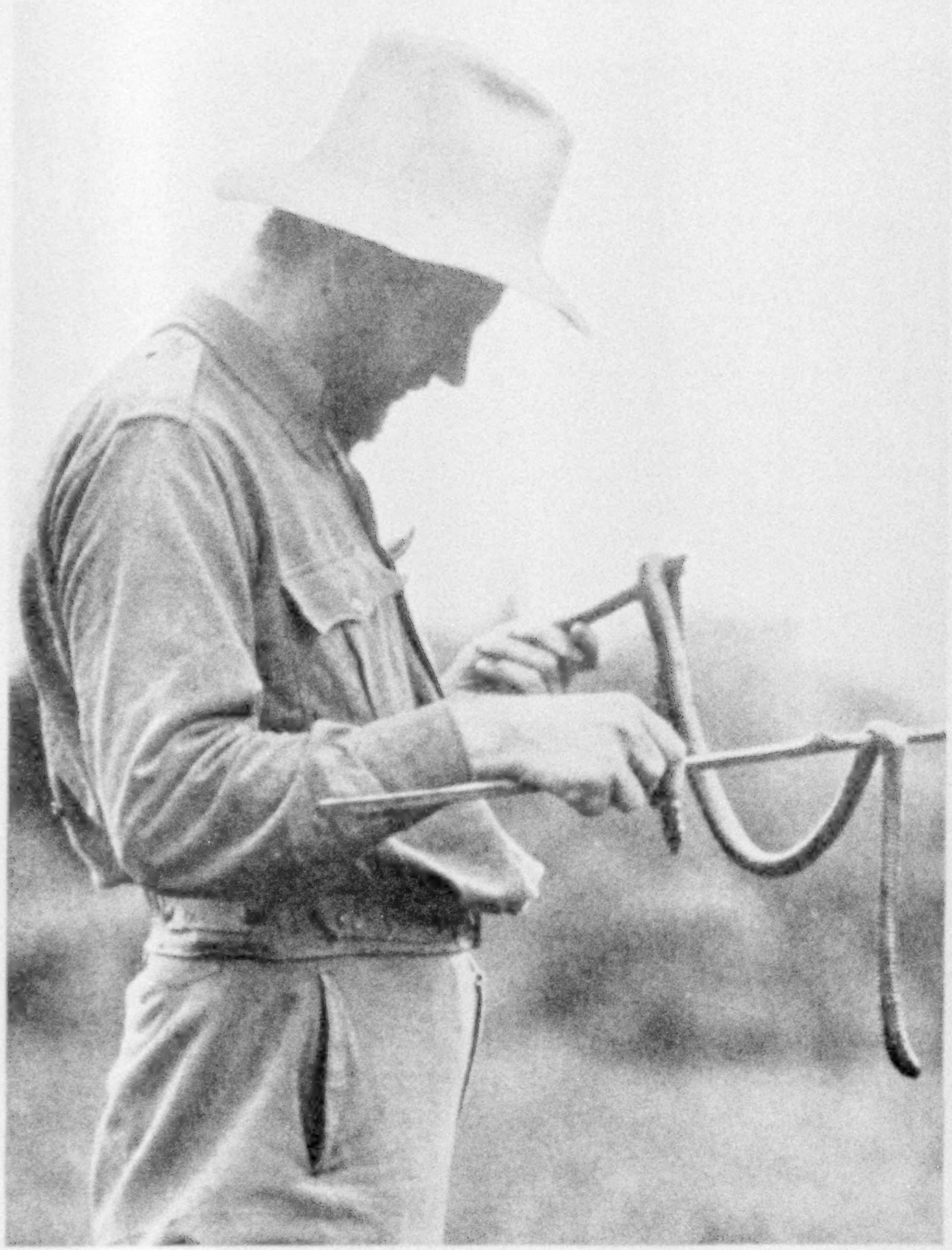
SNOW-BLINDNESS AND FAIR WEATHER!

We had left camp at 6 o'clock in the morning; it was 5 in the evening when we returned. My eyes felt very tired, a symp-



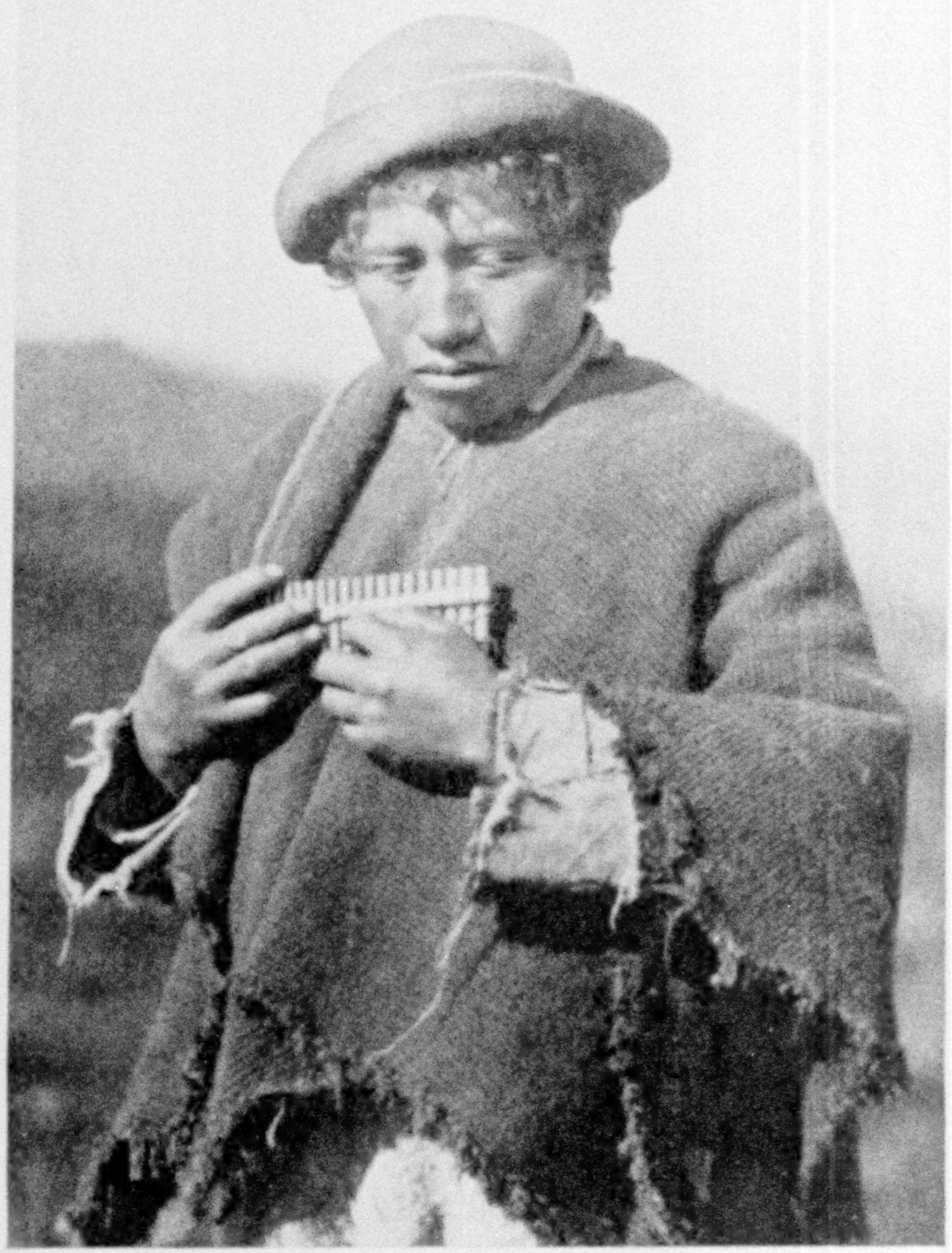
ONLY FOR BRIEF INTERVALS DO RIFTS IN THE CURTAIN OF CLOUDS PERMIT A VIEW OF SANGAY'S SNOWY SUMMIT

Up to this point in the valley of Culebrillas, two other men had penetrated before the author's party. Beyond it there is no written record of any human being having previously set foot (see text, page 49). The coarse prairie grass in the foreground is covered with raindrops.



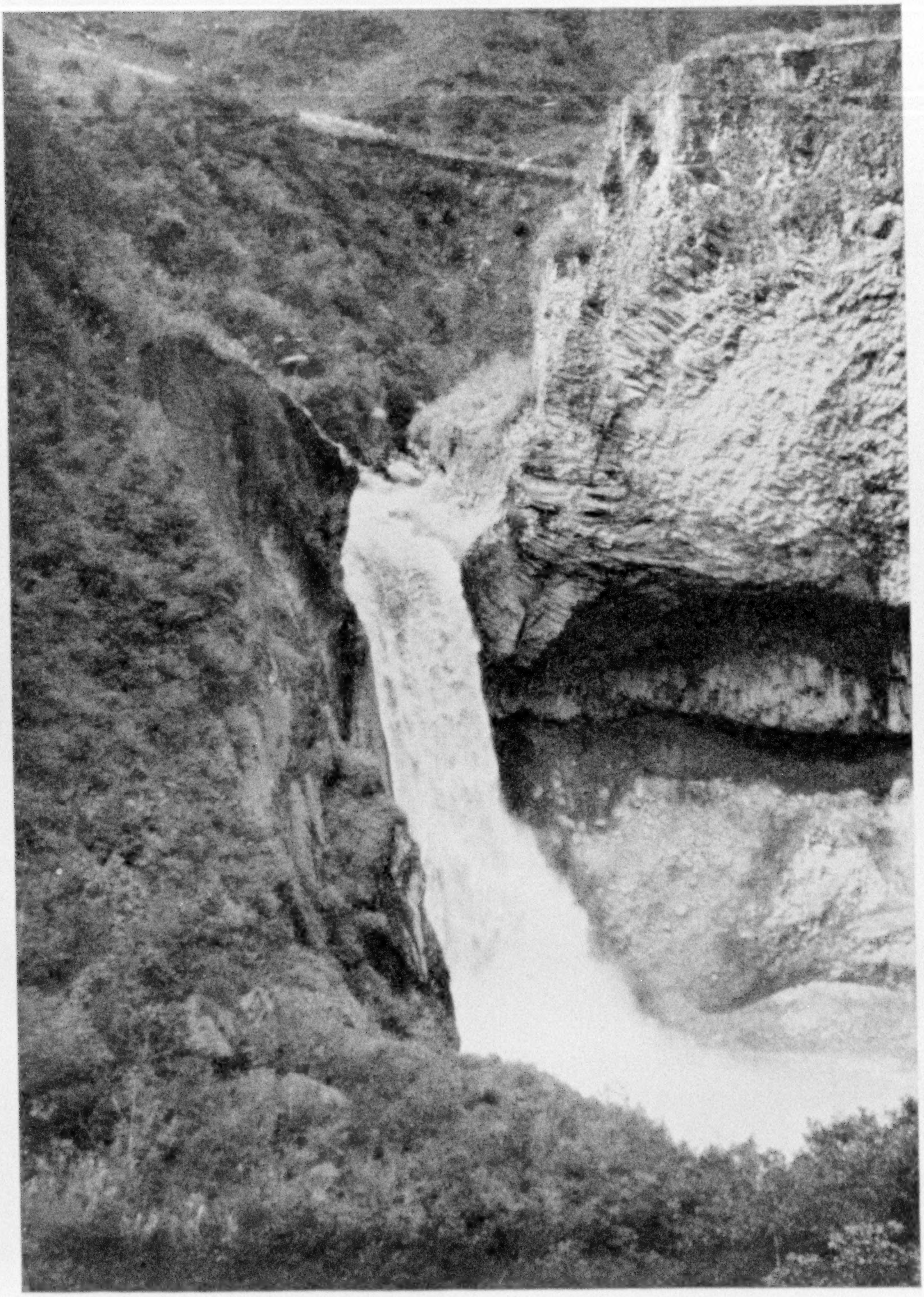
SOME EARLY BIRD MISSED A GOOD BREAKFAST

To pass away the time and to augment the expedition's larder, Messrs. Dyott and Johnston occasionally went fishing. The latter's particular mission was to hunt worms—large worms. The most extended specimen that fell to his spade was an earthworm with a five-foot stretch.



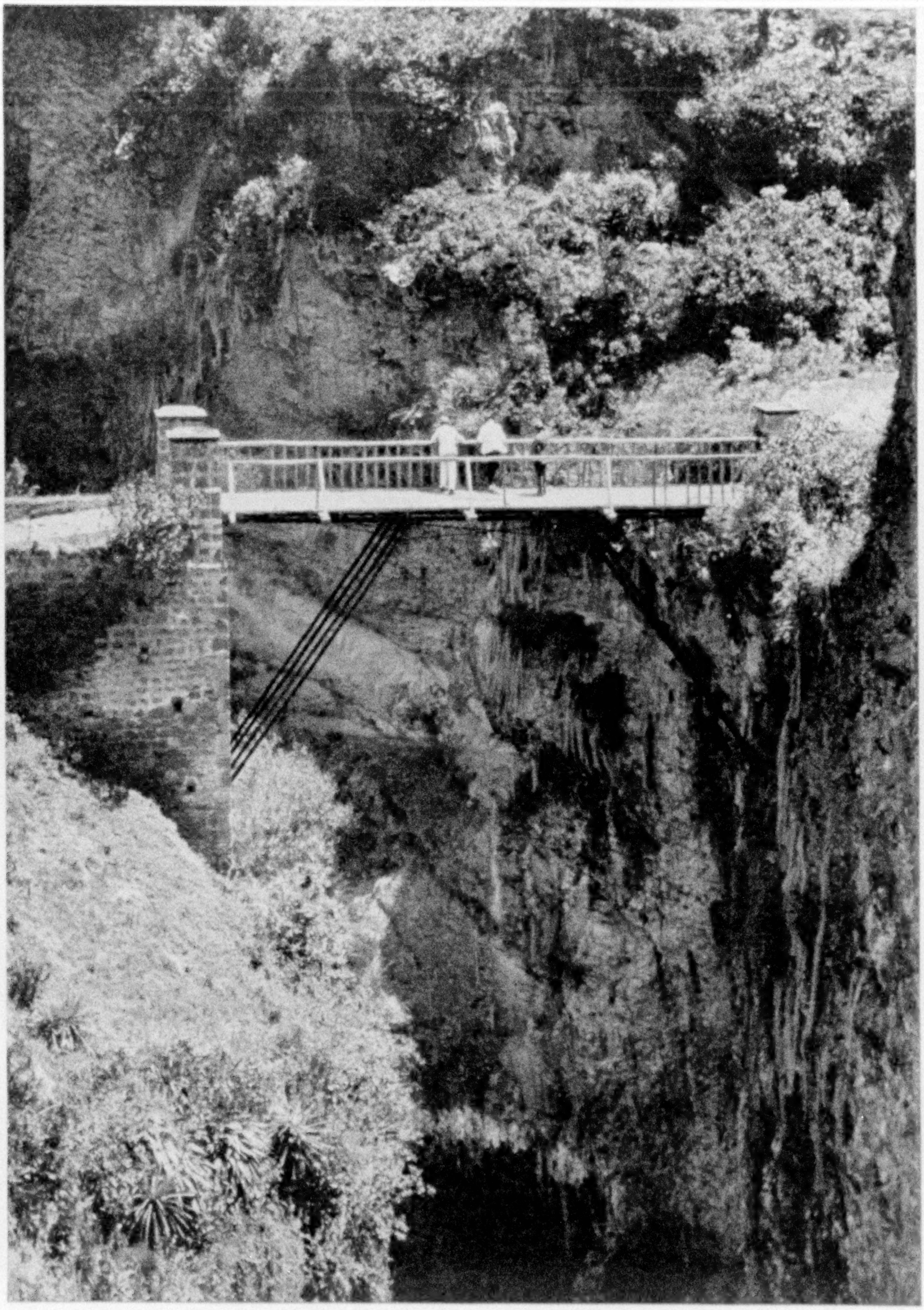
HIS PIPES OF PAN PRODUCE DOLEFUL MUSIC

The *rondador* of Ecuador is made of reeds, and emits plaintive notes that seem to express the philosophy of him who plays it. The Indian strikes upon a combination of notes that is pleasing to his ear and repeats them until he has fairly hypnotized himself and distracted his hearers.



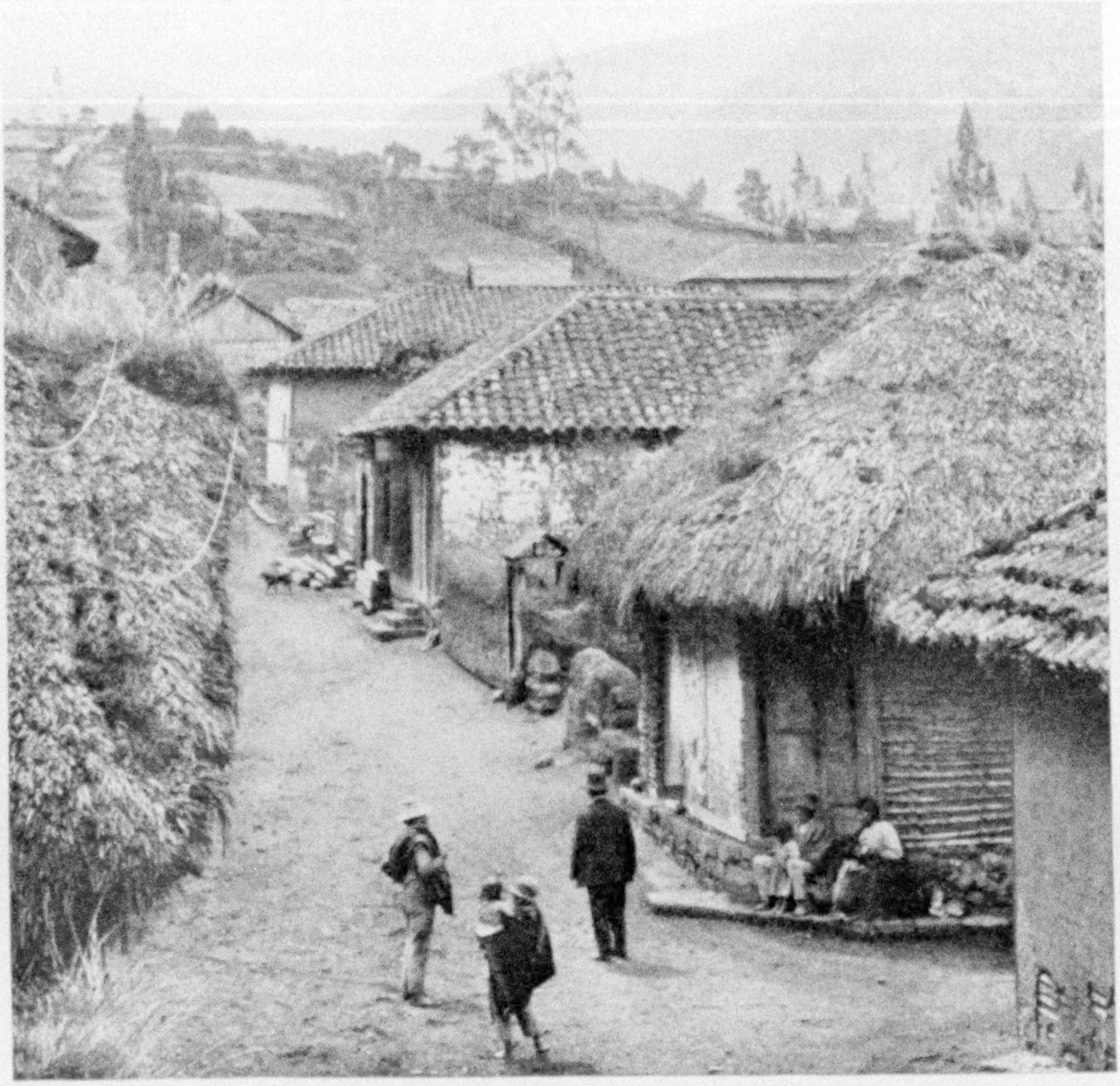
VAST POWER RESOURCES ARE HIDDEN IN THE JUNGLES OF ECUADOR

The Falls of Agoyan, 190 feet high, plunge over an old lava flow which years ago filled this valley to a depth of several hundred feet. This is one of numerous cataracts in the Andean republic which together could generate in the neighborhood of a million horsepower. Most of the energy, however, is purely potential, for only a fraction of it has been harnessed.



DEEP CANYONS CUT THE TRAIL LEADING TO BAÑOS

The Ecuadorian Government maintains this highway in good repair. In many places bridges are necessary to span canyons cut in the lava by the ceaseless action of the Pastaza River. Rails for a railway were provided here a number of years ago, but the project did not materialize, and they have been utilized in some cases to make bridges such as this.



THE VILLAGE OF BAÑOS SNUGGLES AT THE BASE OF GIANT TUNGURAHUA

This quiet little village is celebrated for the medicinal value of its thermal springs. Eucalyptus trees grow round about and bananas and sugar cane just manage to survive at this elevation.

tom which I recognized only too well. I turned in that night conscious of the fate that awaited me. The next morning I was snow-blind. I lay back in the hut with red-hot tears streaming out of my eyes and my face swollen like a football. Johnston regaled me with news of clear weather.

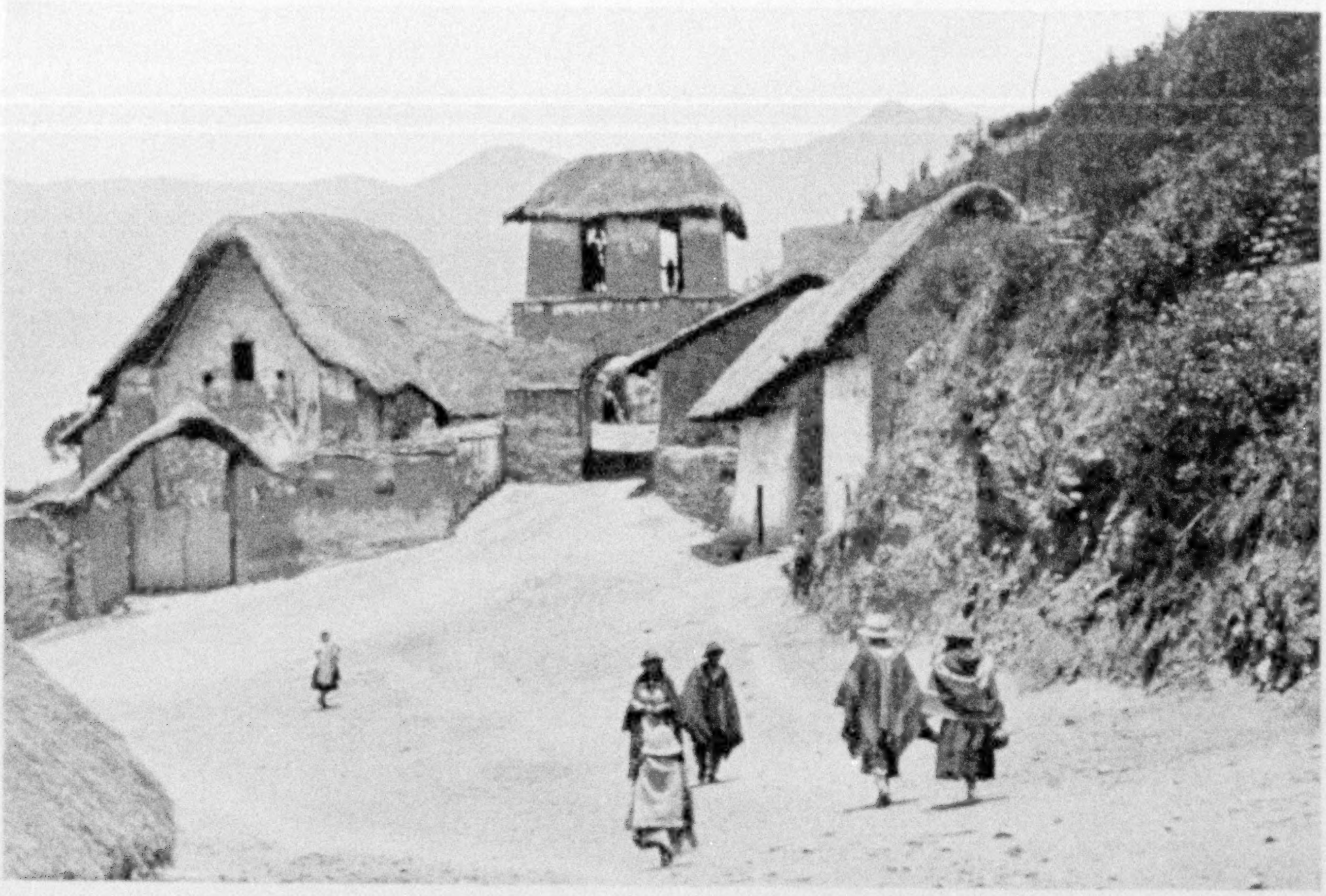
It was the irony of fate: after weeks of persistent rain, a fine spell had at last set in.

For a whole week I remained in this unfortunate condition, and we experienced some difficulty in restraining our porters from deserting us. When my eyesight returned, Johnston and I decided to make a final attempt to reach the summit. This time we wore smoked glasses.

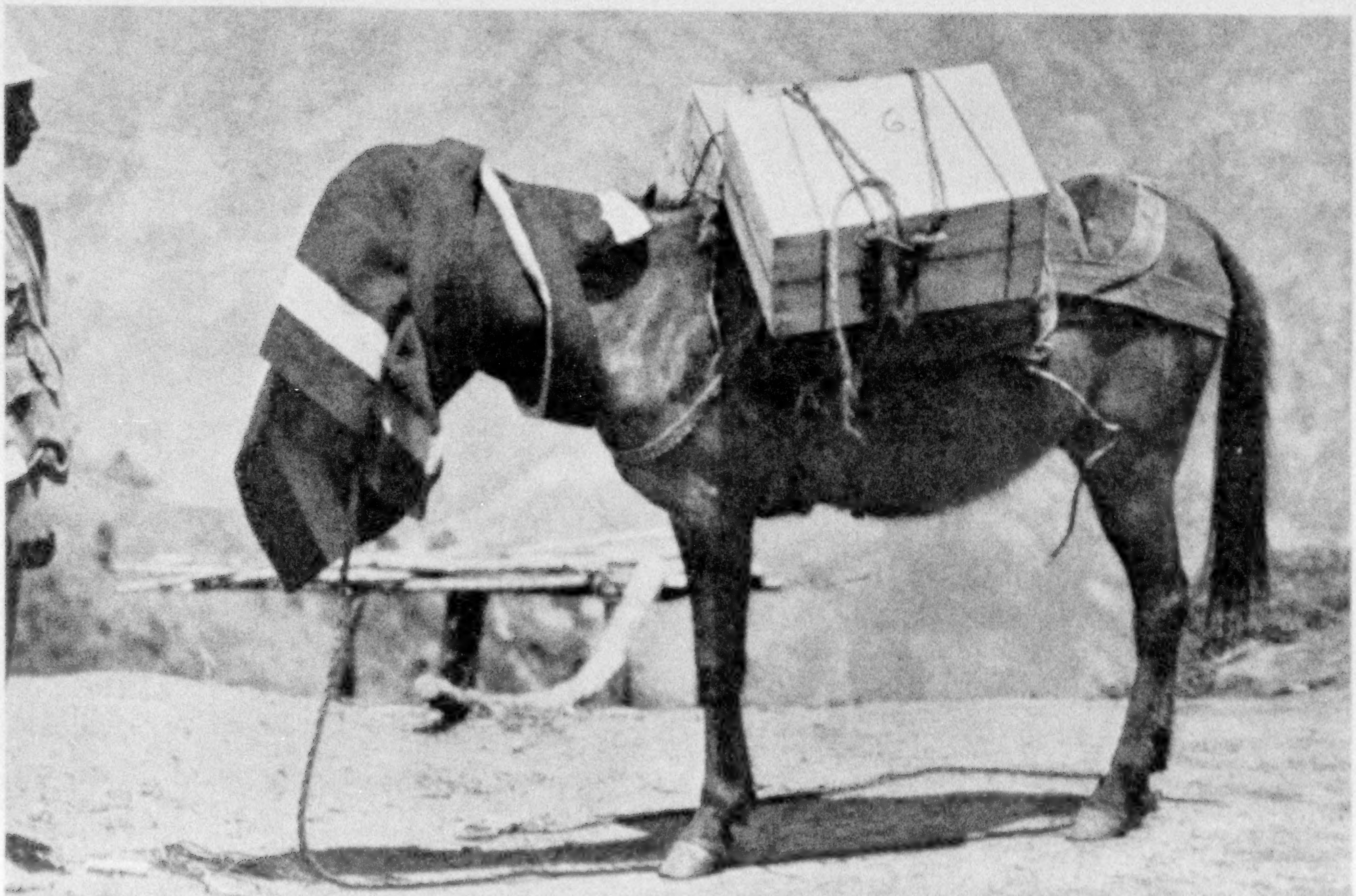
We ascended comfortably to the snow-line, but our boys were not inclined to go farther. My companion and I therefore went on alone. Within a thousand feet of the summit, Johnston began to feel the effects of the altitude and I had to leave him behind.

WITHIN 400 FEET OF THE TOP

In three hours the end of my old trail was reached, and I felt as if I had reached the end of the world. The snow at this elevation was particularly soft and, although the gradient was easing up

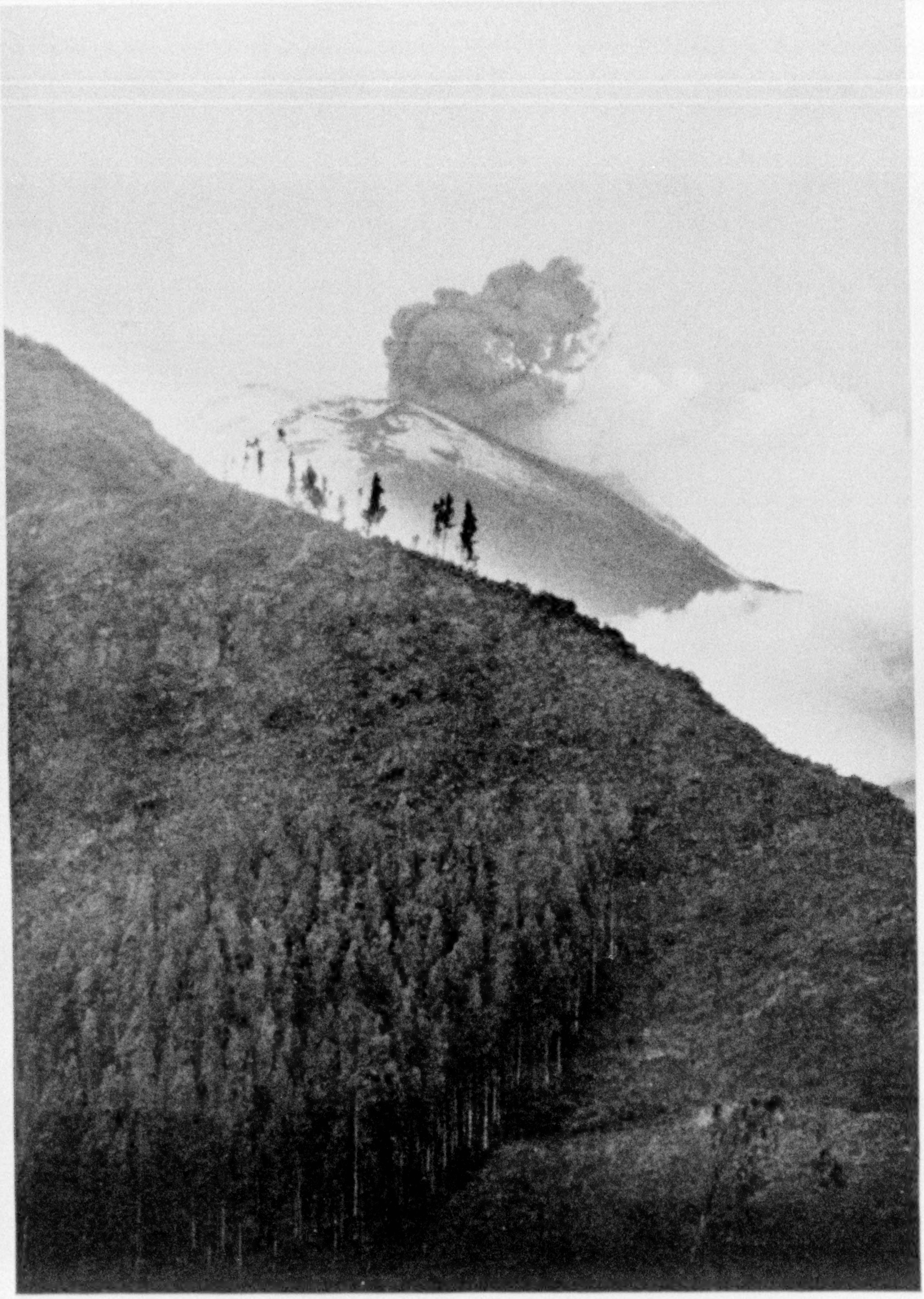


HOUSES IN THE INDIAN VILLAGES OF THE ANDES ARE MADE OF ADOBE AND THE ROOFS ARE USUALLY THATCHED WITH GRASS



OVERCOMING "MULISHNESS" WITH A BLANKET

Loading a pack animal is sometimes difficult work, especially if it is young and nervous. To forestall trouble, the Indian drivers frequently cover the head of the animal with a blanket.



FEW SIGHTS ARE SO AWE-INSPIRING AS A FIRE-BREATHING VOLCANO

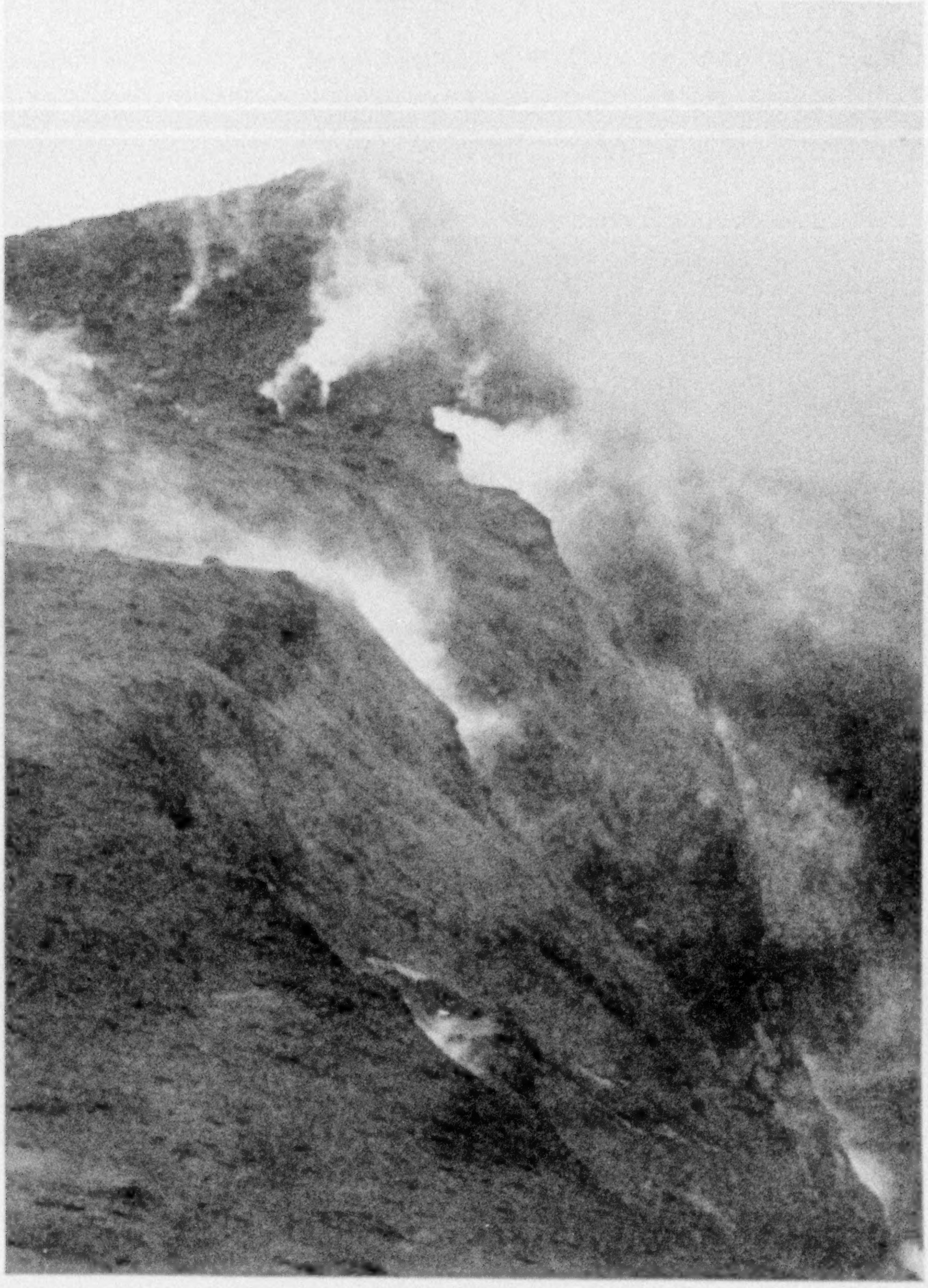
Tungurahua, the Black Giant, is a constant menace to the surrounding country. Mysterious rumbling noises in the heart of the earth and slight tremors are of frequent occurrence around the village of Baños (see text, page 68).

appreciably, I advanced at a snail's pace. I failed to tamp the snow down hard enough. Consequently I sank in deep and had all the extra labor of pulling myself out again, but I scrambled on until within 400 feet of the crater. The black masses of rock which stood out so conspicuously at a distance were not far above my head, but a long snowfield led up to them.

While considering the best route to follow, I suddenly sank to my waist. Quickly extricating myself, I landed in a still deeper hole, almost to my armpits. I bent double, so as to distribute my weight more evenly on the white softness about me, and slid down a little way. That was the beginning of the end. Common sense triumphed and I had to admit defeat.

The hour was late and there was barely time to reach camp before dark; so I hastened back. I encountered Johnston by the wayside valiantly advancing in spite of mountain sickness. Had he been given time, he would have climbed as far as I; but his size and weight were handicaps in the soft snow.

To offset our failure we had, at any rate, accumulated much valuable data on a region hitherto untouched and had blazed a trail which others, with better equipment and greater financial resources, can follow to the top of Sangay.



STEAMING JETS ISSUE FROM HOLES ALONG THE EDGE OF TUNGURAHUA'S CRATER

During one ascent made by the author and his party the noise was terrific and the heat sufficient to enable the explorers to cook their food (see, also, illustration, page 78).

ON THE ROAD TO TUNGURAHUA

Returning to Riobamba, we turned our attention to Tungurahua. To reach the base of this ugly heap of smoldering rocks and snow was child's play compared to what we had just experienced with Sangay. We would be saved the task of exploring vast areas through which unnamed rivers ran, because an excellent trail wound its way to the very foot of the mountain where snuggled the picturesque village of Baños, celebrated for its thermal springs (see illustration, page 64).

As Don Miguel had been our mainstay in our first venture, so Don Nicolas Martinez of Ambato steered our steps on our second effort, and to him we take off our hats for the success attained.

Don Nicolas had ascended to the rim of the crater prior to its outburst, some years previously. He had engaged one Peres as his guide and advised us to do likewise. Peres was sent for and arrangements concluded with him for transporting our baggage up the rugged slope of the mountain to a point where vegetation ceased.

With hat in hand, Peres stood in the doorway of our quarters, taking his leave, when a slight tremor of the earth caused us to look at each other wonderingly. It was followed by a distant rumbling sound, like far-off thunder.

"Muy bravo está el Tungurahua" (Tungurahua is feeling very wild), he exclaimed, and then paused a moment or two while the mysterious sounds continued. We listened intently. Peres was the first to speak. "I hope the patron will provide plenty of rum for the party," he said thoughtfully. "A little encouragement is always helpful on excursions like this." With which observation he turned and descended into the street.

Preliminary preparations and the ascent to our final camping place occupied ten days. The last part of the climb was particularly arduous. Having worked our way clear of the forest, which encircled the black giant like a huge belt, we emerged onto more open ground, over which trailed a tangled network of tiny shrubs. Here and there a few stunted trees, with twisted limbs bent at every conceivable angle, reared their fantastic shapes in the air, but ultimately even these veterans of a thousand campaigns against the elements vanished, and the shoulder we were following became bare of everything save grass and moss. It was at an elevation of 12,500 feet that we built two lean-to huts in a sheltered nook.

A SUDDEN TEMPEST HALTS THE FIRST CLIMB

The afternoon of our arrival I decided to make a preliminary reconnaissance over the cinder zone. I left Johnston to superintend the camp and set out with Peres. In a few minutes we were zigzagging up the purple slope.

Two hours of steady toil brought us alongside some massive rock outcroppings which form a distinctive feature of Tungurahua's profile from the northwest. While we paused here for a breathing spell, an opening in the mist revealed dense storm clouds drifting down upon us.

"Let us go, patron," cried Peres; and go we did, retracing our steps at breakneck speed. A rift in the mist disclosed our encampment, and we had just managed to pile in under cover when a terrific blast struck us.

By 5 o'clock the tempest had blown itself out. Peace was restored and Tungurahua once again appeared in robes of virginal whiteness. Our camp faced west, and in front of us rose the glittering dome of Chimborazo, head and shoulders above any other peak of the great Andes of the Equator. With the setting sun the last breath of wind died away and the few remaining clouds dissolved, leaving a thousand square miles of broken country clear to gaze upon (see page 51).

STARS LIGHT THE WAY

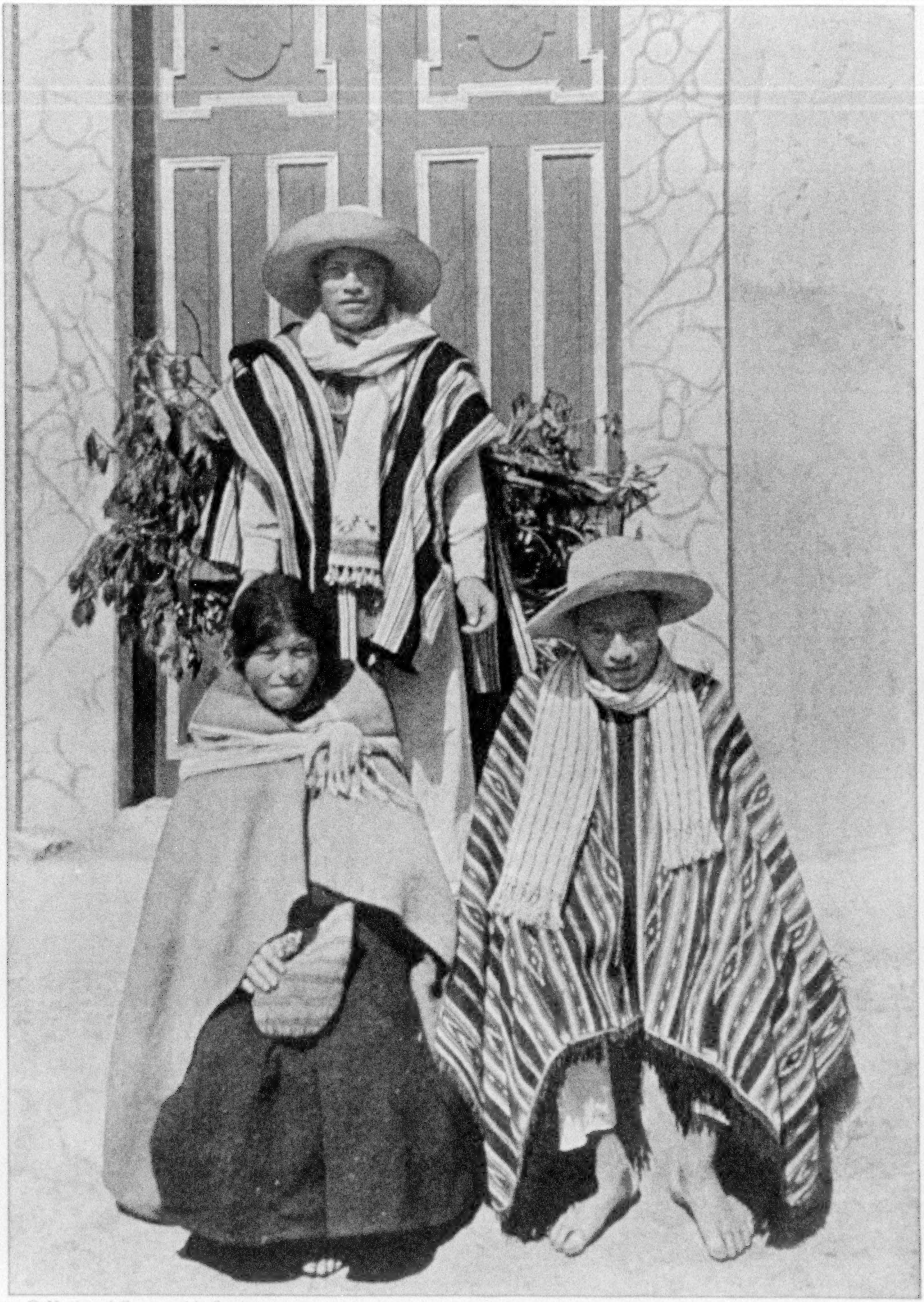
When we started next morning it was pitch dark, except for the stars. We were an ill-prepared lot of amateur climbers. Our boys, in flowing ponchos, loose cotton trousers, and sandaled feet, were miserably clad to withstand the cold of 16,000 feet elevation. They plodded along slowly, long sticks in their hands and cameras on their backs. Peres shouldered a bundle of provisions.

Four hours after leaving camp we cautiously crept over the crest and found ourselves in a vast expanse of ice and snow smothered under a layer of ashes. We turned west and more cautiously than ever picked our way among hundreds of fumaroles which spurted forth clouds of steam.

Stepping from one snow hummock to another, we tested every bit of surface with our long sticks before trusting our weight to it. As we groped along a gust of wind suddenly drove the mist away and we found ourselves face to face with the fire-breathing crater of Tungurahua—a colossal hole boring deep down into the heart of the world (see, also, page 66).

LOOKING DOWN INTO THE MOUTH OF THE MONSTER

The great gaping mouth, with a span of more than 200 yards, was streaked with a variety of colors, chiefly purple and gray. Here and there, low down in the monster's throat, were patches of red. The farther lip was set with jagged rocks sticking up



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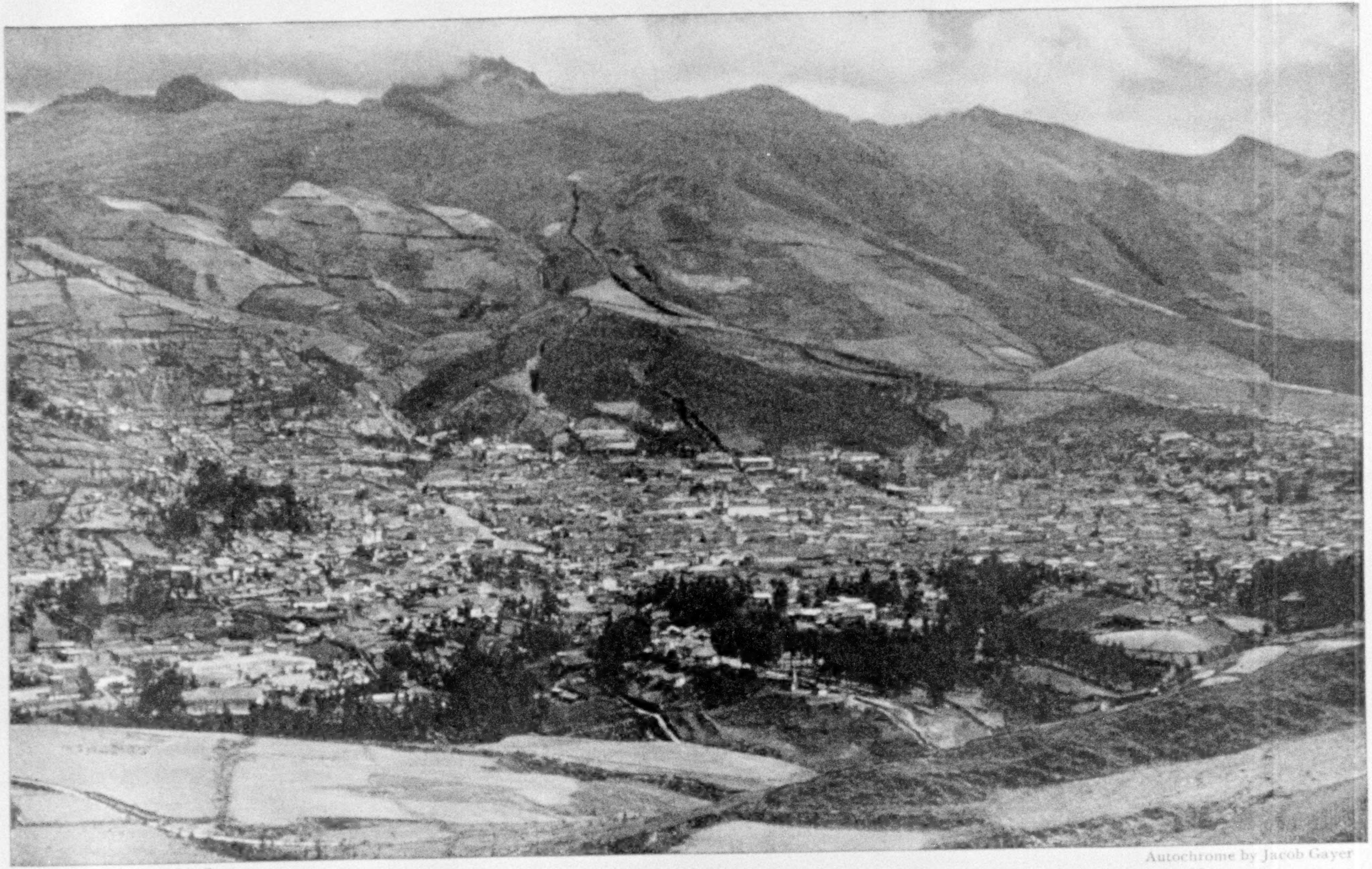
PONCHO-CLAD INDIANS OF ECUADOR'S HIGH PLATEAU

Shoes do not enter into the scheme of living of the Quichua Indian but he takes good care to protect his body against the chill Andean winds. A woolen poncho is an almost universal garb among the Quichuas. Houses in Indian towns are generally built of adobe and the owner frequently paints the door some gaudy hue, to atone for the drabness of the rest of the structure.



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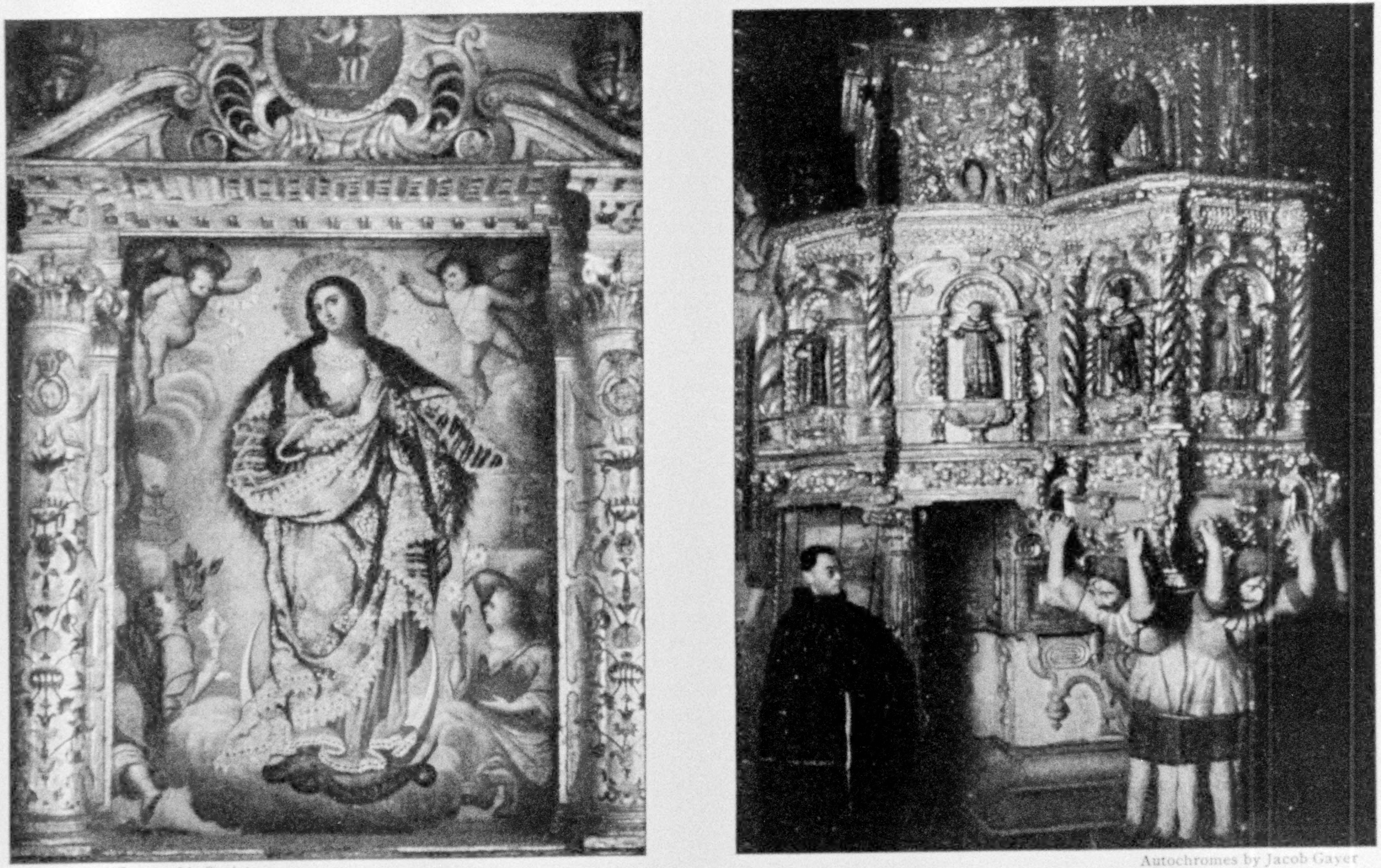
QUITO WAS AN IMPORTANT CITY OF THE INCA EMPIRE LONG BEFORE THE WHITE MAN CAME TO SOUTH AMERICA

Ecuador's ancient mountain capital was connected with Cuzco, Peru, by a military road of which now only traces can be found. Although Quito is situated practically on the Equator its climate, due to an elevation of more than 9,000 feet above sea level, is one of perpetual springtime. Flowers bloom the year round and what the natives call "winter" differs from other seasons mainly in an increased rainfall. The city has a population of more than 100,000.



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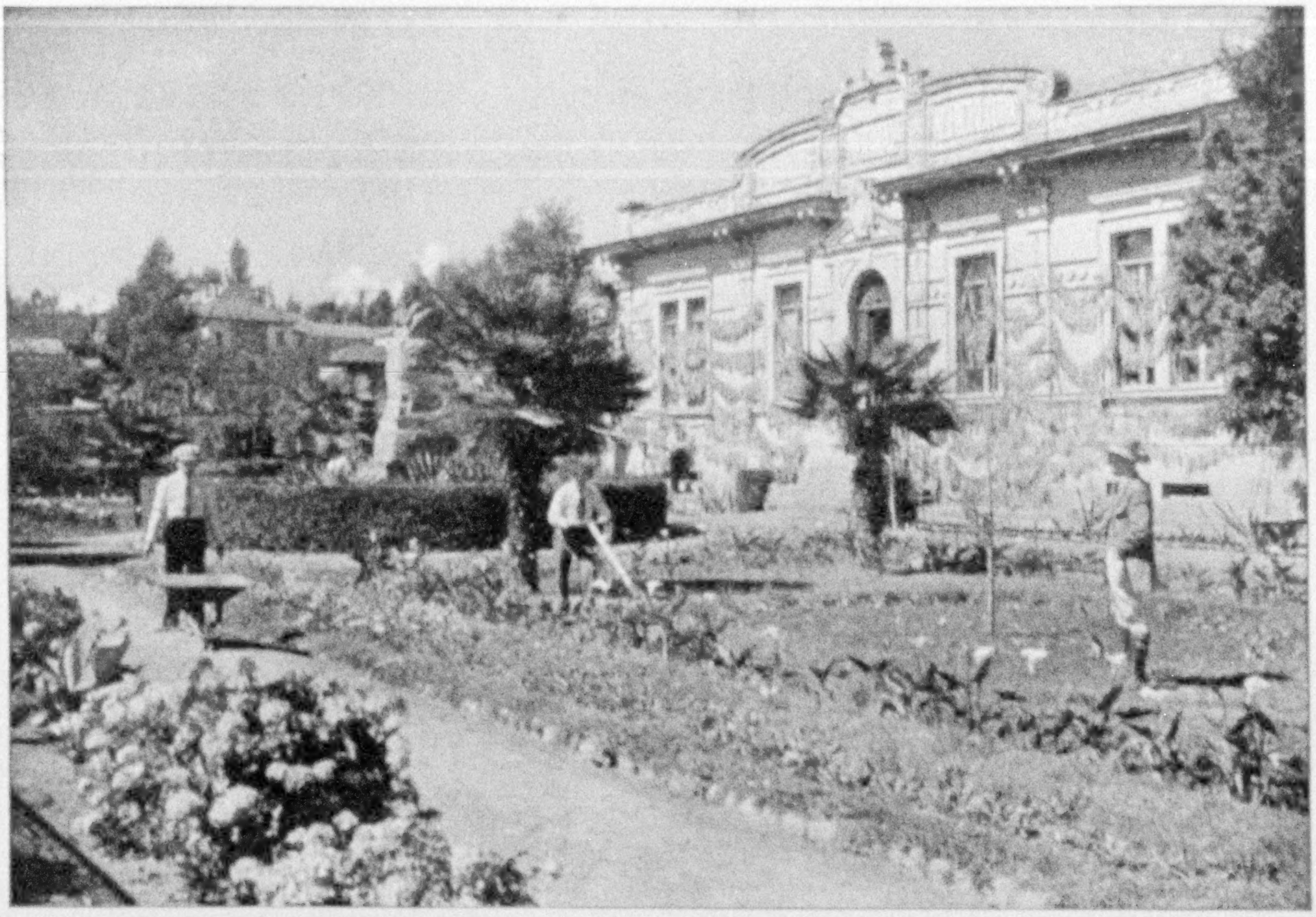
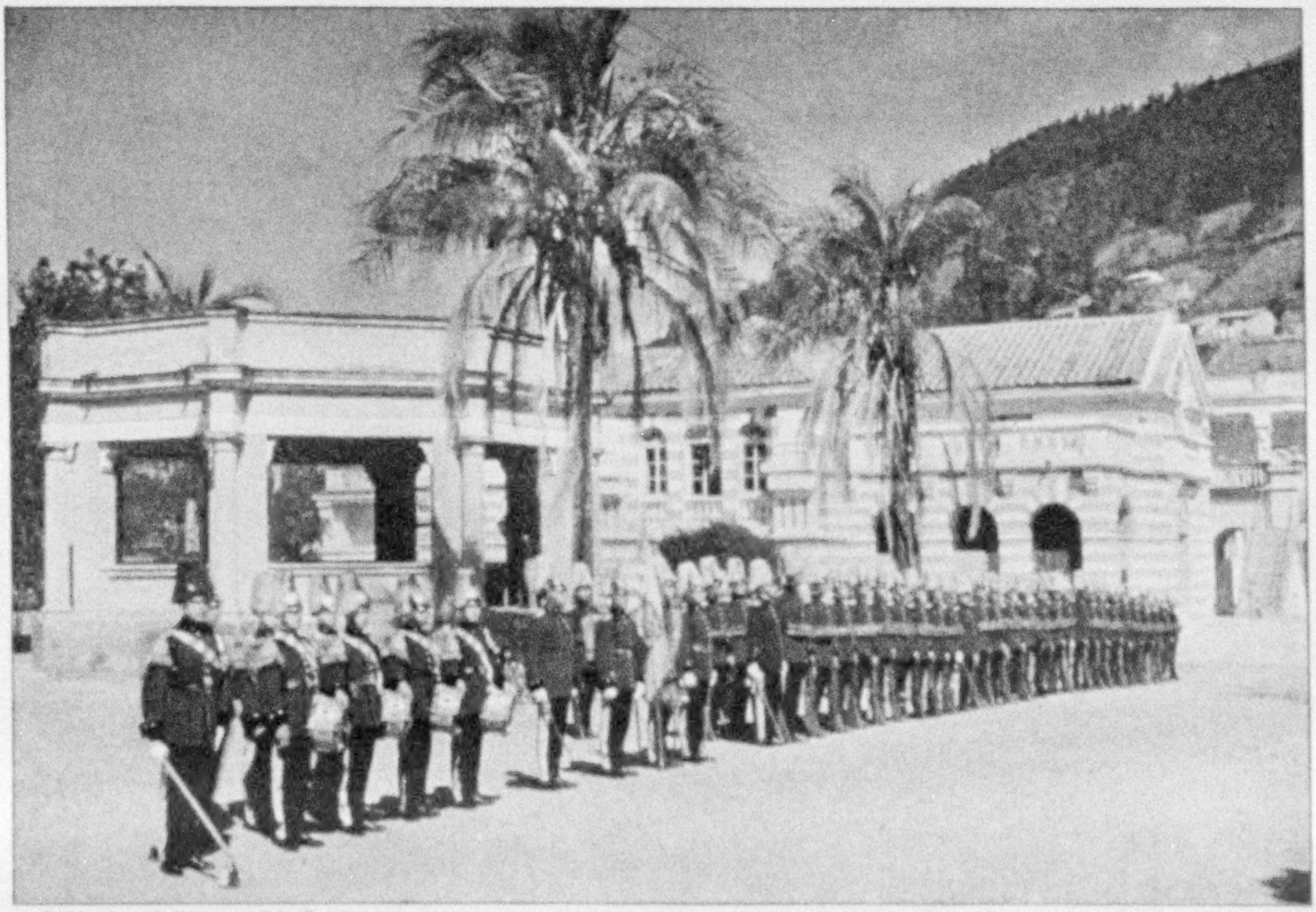
MANY BEAUTIFUL WORKS OF ART ADORN THE MONASTERIES OF THE CAPITAL

Some of the pictures which decorate Quito's religious edifices are the works of old Spanish and Ecuadorian masters. The pulpit at the right is an excellent example of 16th-century woodcarving. The figures supporting the pulpit at one time fell under the displeasure of an ecclesiastic dignitary, who had them removed for a while, but they were replaced. The carved woodwork is covered with gold leaf.



WHERE FARMERS RECEIVE SCIENTIFIC TRAINING

The Agricultural School at Ambato, Ecuador, conducts an experimental station where particular attention is directed to the study of plant diseases and the introduction of new plants into the country. Festoons of drying tobacco leaves are stretched across the front of the main building.



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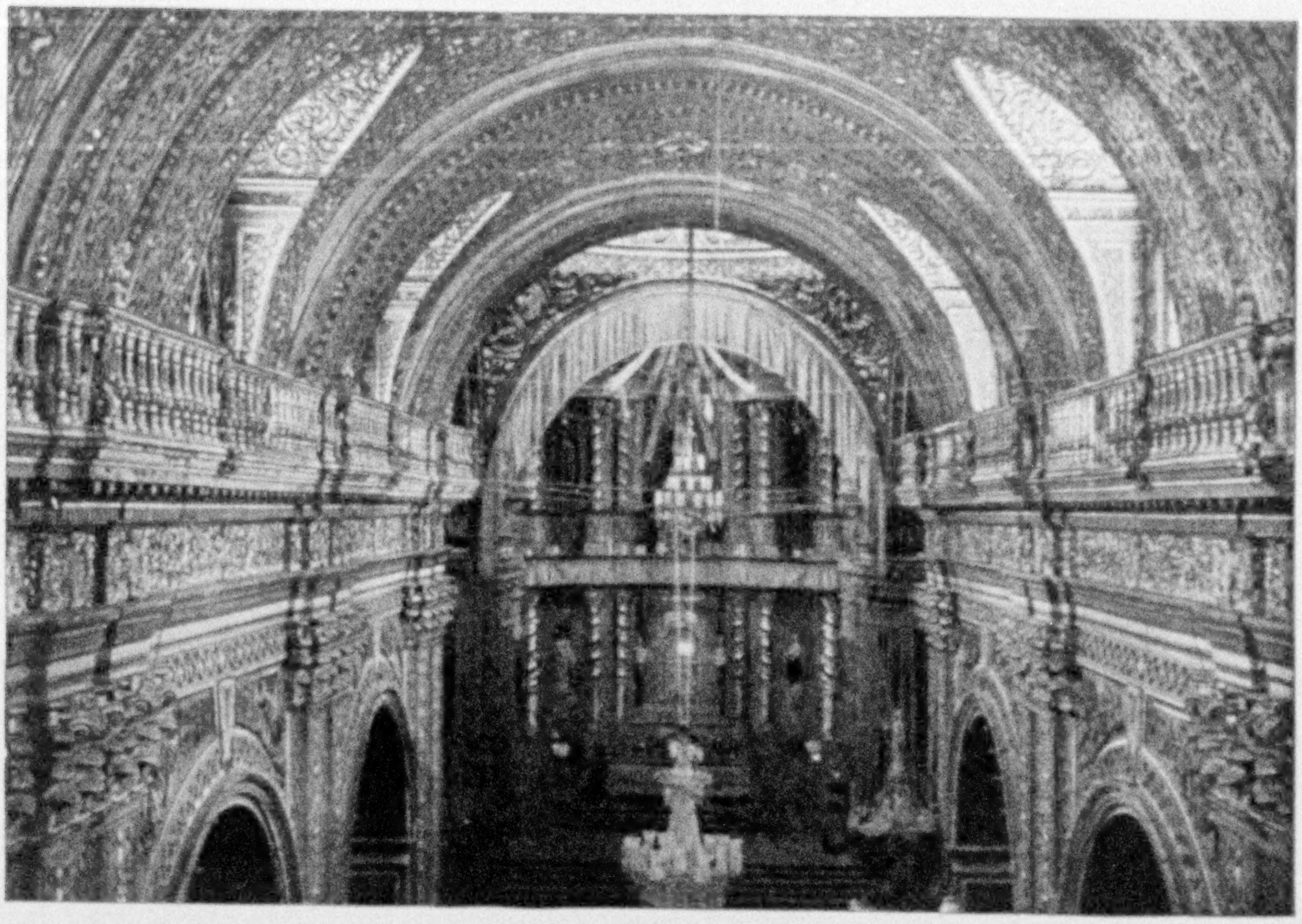
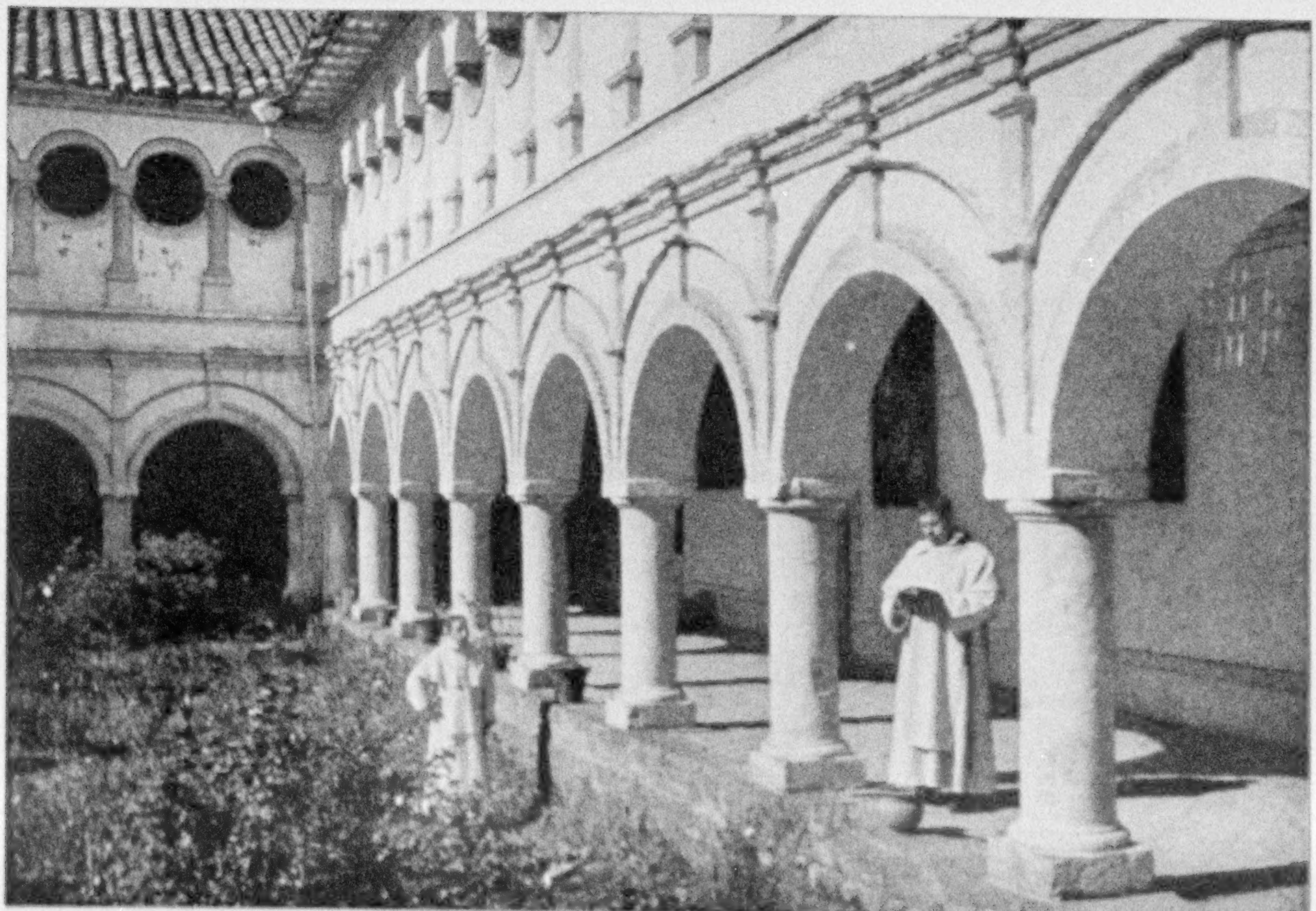
ECUADORIAN "WEST POINTERS" ON DRESS PARADE

The military academy at Quito has a four-year course in all branches of military science and the Republic's army owes much of its efficiency to the thorough training received by its officers in this school.



THE PADRES BUILT FOR THE CENTURIES

The superior construction of churches built by early Christians in South America is evident in these graceful arches of La Compañía, in Quito. The dim light of the interior necessitated an exposure of a full hour to secure this picture.



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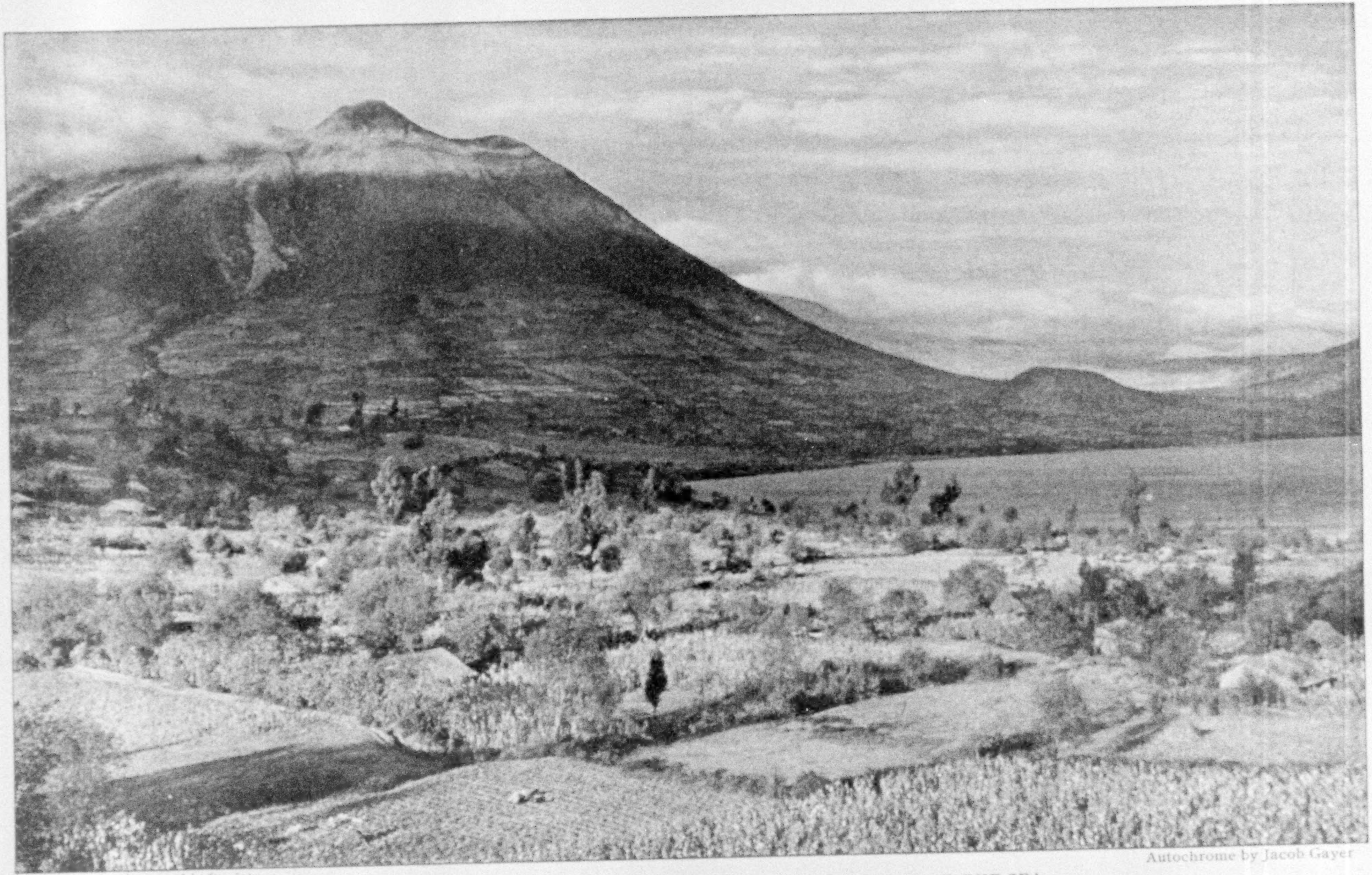
MOORISH ARCHES FLANK THE PATIO OF EL TEJAR

Here the Brothers of Mercy come for recreation, and the warm sunshine of the patio is doubly grateful to them after the chill and gloom of the cloisters. El Tejar is in the capital city.



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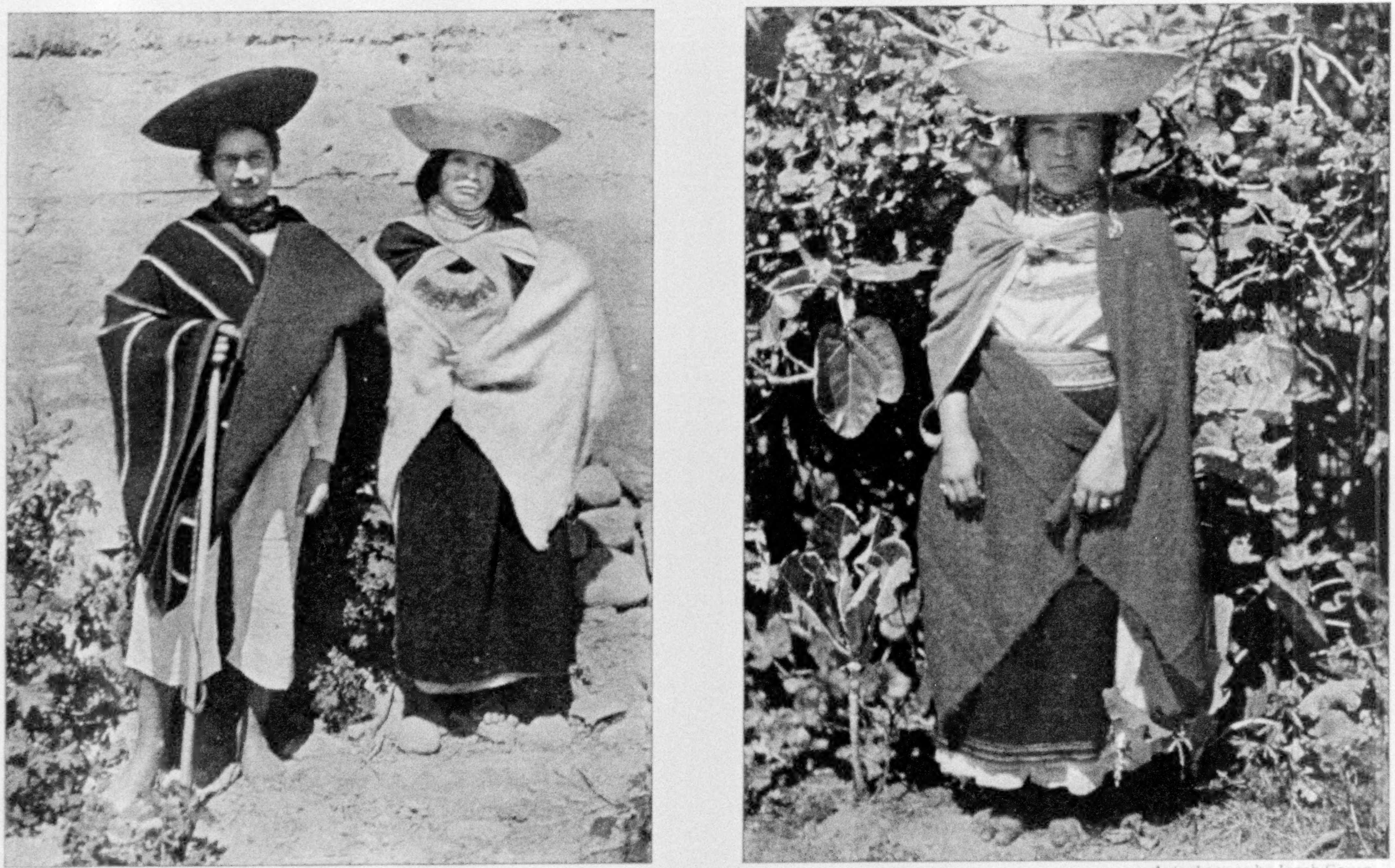
BEAUTIFUL LAKE SAN PABLO NESTLES AMONG PEAKS HIGH ABOVE THE SEA

This fine body of water is surrounded by one of the most fertile regions of Ecuador, at an elevation of several thousand feet. Fields are cultivated high up on the slopes of the extinct volcano Imbabura (left background), cereals and potatoes being the chief crops. Cacao, the principal product of the Republic, can not survive at this altitude. It is grown in the tropical lowlands nearer the coast.



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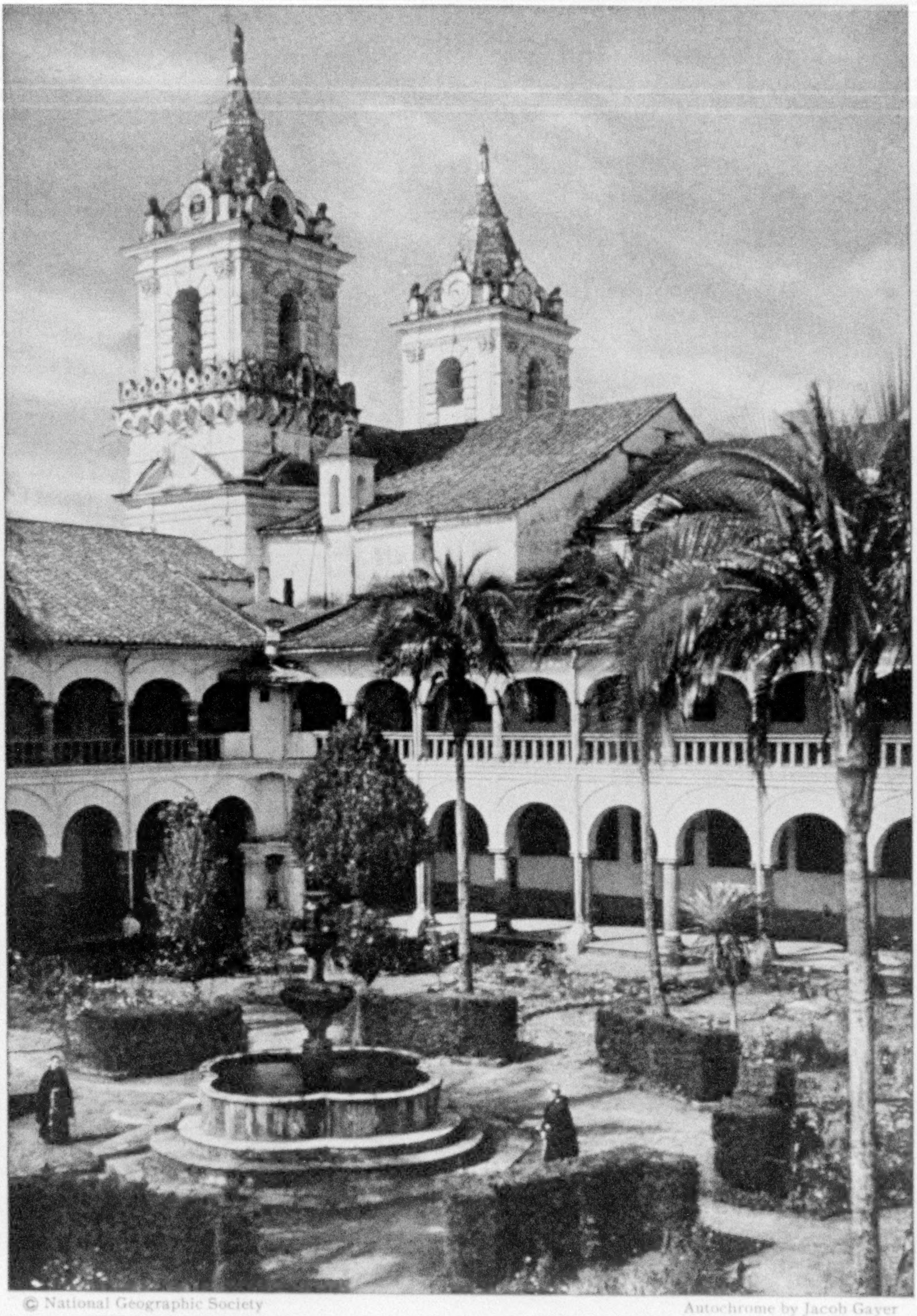
THEIR HATS ARE THE PRODUCTS OF THEIR HOME TOWN, OTAVALO

The peculiar headpieces are handmade, of felt hardened to the consistency of plaster. The idea back of this ponderous type of hat is that its weight may withstand the pranks of the high winds of this region. When the girl at the right is not actually using her gay *rebozo*, it is neatly folded and carried on her left shoulder, thus proclaiming to the world that she is still unmarried.



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THE MONASTERY OF SAN FRANCISCO, FOUNDED SHORTLY AFTER THE COMING OF THE CONQUISTADORES

Quito is a city of many monasteries, among which this is one of the most important. The capital is a modern city, and to step from its motor-traveled streets into the quiet of one of these houses of prayer and reflection is to turn back 400 years of history.

in the air like angry teeth bared to the heavens. The volcano's poisonous breath was exhaled in a column of yellowish vapor, heavily charged with sulphur.

To add to the eerie nature of the scene, innumerable fumaroles intermittently belched forth clouds of steam. In many places hungry flames rippled by the rocky slopes, while from below came a dull, heaving roar the like of which I had never experienced.

The whole effect was terrifying. I recalled a despairing remark Peres had made on our way up: "Señor, it is impossible to proceed farther. The whole mountain is on fire." He was not far wrong. From every nook and cranny issued clouds of steam, which gave one the impression that the whole place was just about to burst into flames (see page 67).

Dust blinded our eyes, icy drafts chilled our spines, and the soles of our feet were scorching; ice and snow, fire and vapor were mixed in the most intimate confusion.

At 3 o'clock in the afternoon dense clouds rolled up from the east and put an end to our activities. Cameras were collected and we retraced our steps.

The next day a second ascent was made, and this time Tungurahua was in a very different mood. A curious stillness held the frozen world tight by the wrist. Not a murmur came from the purple throat. The fangs on the farther lip of the crater stuck up cruelly clear, as if snarling at the peaceful sky. Not even a labored breath was audible.

Steam still struggled out between bowlders and rolled lamely up into the air. A few sickly flames rippled despairingly up the giant's palate, but to our pygmy eyes Tungurahua, the black and terrible, seemed to lie dead at our feet.

THE DEAD COMES TO LIFE: THE FURY OF TUNGURAHUA

Mist started to accumulate and a hurrying breeze bore in invisible arms an appropriate winding sheet of snow-white clouds in which to wrap the face of the departed. Here, on this funeral pyre, only the steam jets sighed forth a prayer for the spirit of the volcano, and sobbing winds that had lost their way stole around the barren rocks bemoaning the tragedy.

Suddenly a number of fumaroles began to awake. New ones sprang up and old ones, rejuvenated, began to spurt forth enormous clouds of vapor. Along the low lip of the crater appeared a compact row, which hissed out streaks of whiteness into the morning air. The noise of internal commotion grew louder and louder, as if the safety valves of a thousand boilers had suddenly been opened to ease excessive pressure within.

Our boys were lined up on the crater edge for one last motion picture. While I cranked the handle of my camera the whole floor of the pit trembled, the rocky mass appeared to rise and fall, as if floating on water; rocks began to bob up and down like corks.

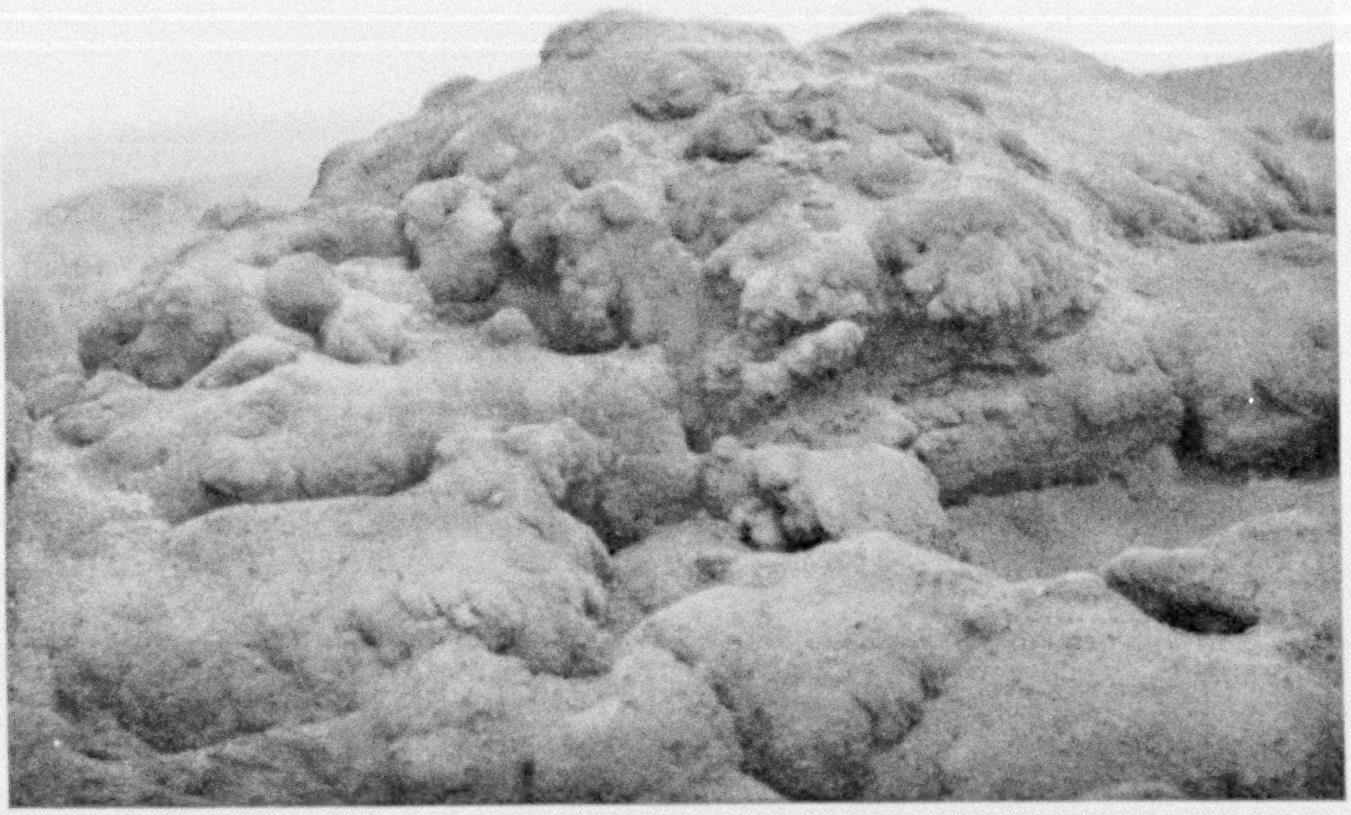
Before we had time to realize what was happening, the dead came to life. Tungurahua awoke and shook with pent-up fury. The bottom of the crater was suddenly transformed into a living, writhing mass. Convulsion followed convulsion, until everything seemed to break loose at once. A deafening roar came from the bowels of the earth, and then the scenery shot up into the void and disappeared over our heads!

SITTING ON A VOLCANO WHEN THE CORK BLOWS OUT

The confusion and din that followed baffles all description. Clouds rushed madly into the heart of the disturbance, only to be split by the great column of squirming blackness which had been hurled aloft like a projectile from the barrel of a gun. A reddish glow diffused itself in the mist. Rocks fell in the snow about us with sickening thuds.

As there seemed to be no avenue of escape, my one thought was to get a photographic record of what was going on. Unfortunately, the black smoke turned day into night, and very little was possible. A series of minor explosions generated additional clouds of dust and ashes. Dirt got into our eyes, our mouths, our ears; it lodged on our clothing, stuck to the camera. Everything was like sandpaper to the touch.

In the everyday life of Tungurahua nothing very unusual had happened; only the cork had blown out. But if ever you are so lucky as to be sitting on a volcano when the cork blows out, you will never forget it.



GRAY SNOW COVERS THE SUMMIT OF TUNGURAHUA

A large snow field, which has been nearly smothered under cinders and ashes, extends around the top of this volcanic peak. At the time of the author's ascent there were several acres of hummocks such as these (see text, page 68).

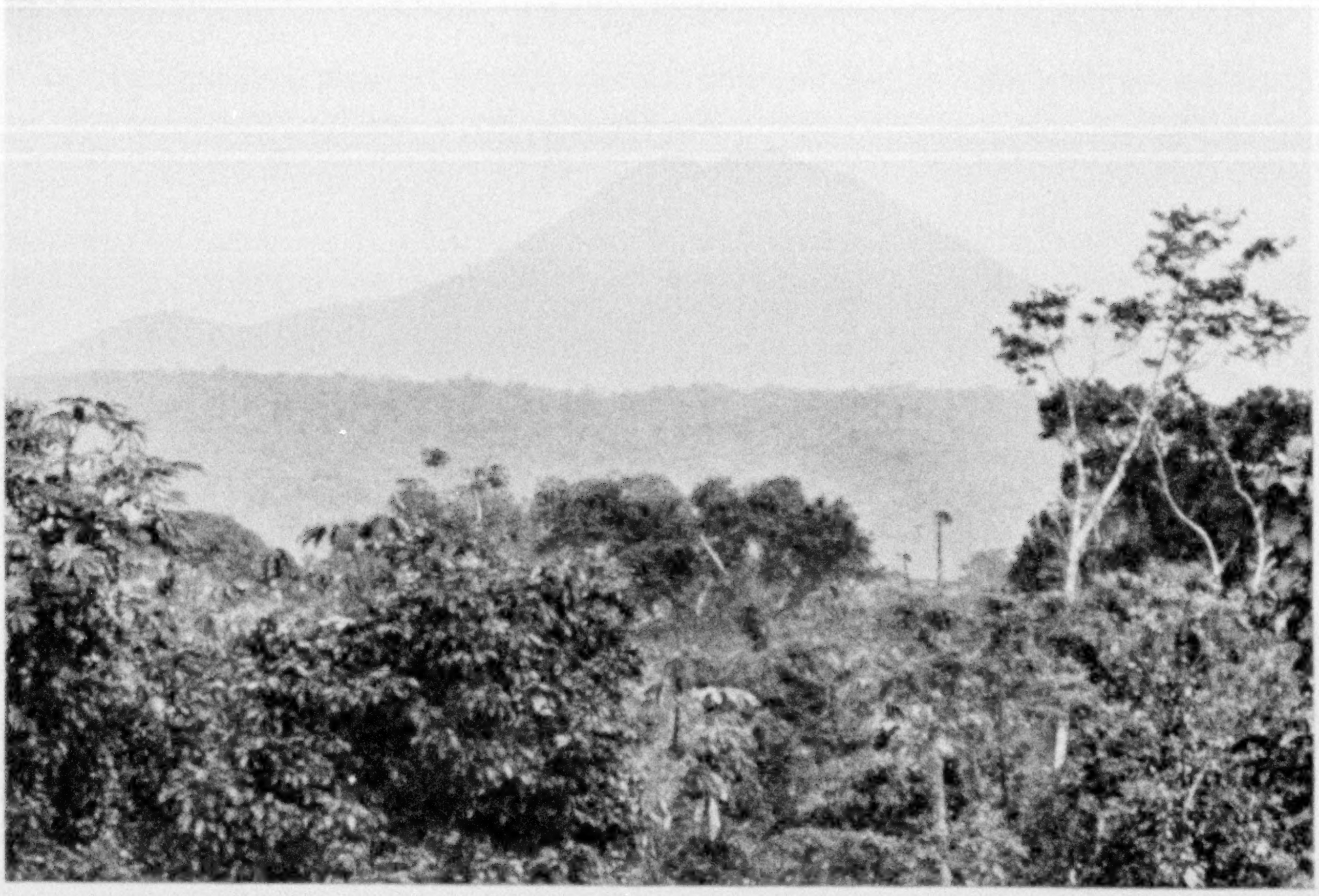
In our case the saving factor was our proximity to the seat of action. We were occupying the front row of the stalls, so to speak, and all the trouble passed over our heads into the valley below. Large bowlders, too weighty to be hurled clear of the crater, fell back into the seething vortex, where they were crunched to atoms and flung up into the air again, so much dust to the wind. There was no flow of lava or ejection of molten material.

As the wind veered round, we moved with it to the northeast side to avoid being suffocated by the acrid fumes. Once again we put up the camera in position. But one could never do justice on film to such a sight as this. It was altogether too vast, too stupendous. One moment all would be hidden in smoke, then a powerful gust of wind, and for a second the crater would be swept clean. We could see the happenings going on within. Then a crash like thunder and the bottom of the pit would rise in the air and all would be darkness again.

The vibrating din from the crater, the incessant rush of escaping steam, the shrill whistle of the wind, do not lend themselves to pictorial reproduction. When now I view the film in the silence of a theater, it looks uncanny, a mere dream; half the reality has gone out of it. To make an audience understand our sensations when taking the pictures, it would be necessary to seat them on blocks of ice, pour sand down their necks, and then blow up the building.

RETREATING IN THE FACE OF MUD AND SNOW

After half an hour conditions grew rapidly worse. We were treated to a deluge of fine mud, and then snow began to fall. I gave the signal to make all haste for camp. The men were glad to be off. They had been eating ashes and sulphur long enough and were suffering from the cold. In spite of discomfort, they were all extraordinarily cheerful and joined with us in the feelings of awe and wonder which such an experience engendered. Loads were adjusted in record time, and away we went toward base camp. Snowstorms at 16,000 feet are no joke.



SUMACU RISES SHEER FROM THE PLAINS OF THE AMAZON

The way to this little-known extinct volcano led through dense jungle. This was the last of the Ecuador peaks scaled by the author.

Tungurahua could not rest; great masses of smoke continued to curl up from the crater, and it was not until twenty-four hours later that tranquillity was restored. Even then it was only for a brief period, as the very day we were packing up our kit the camp quivered and a heavy rumbling noise proclaimed the fact that the great giant was once more about to clear his throat.

MYSTERIOUS SUMACU BECKONS FROM AMAZONIA

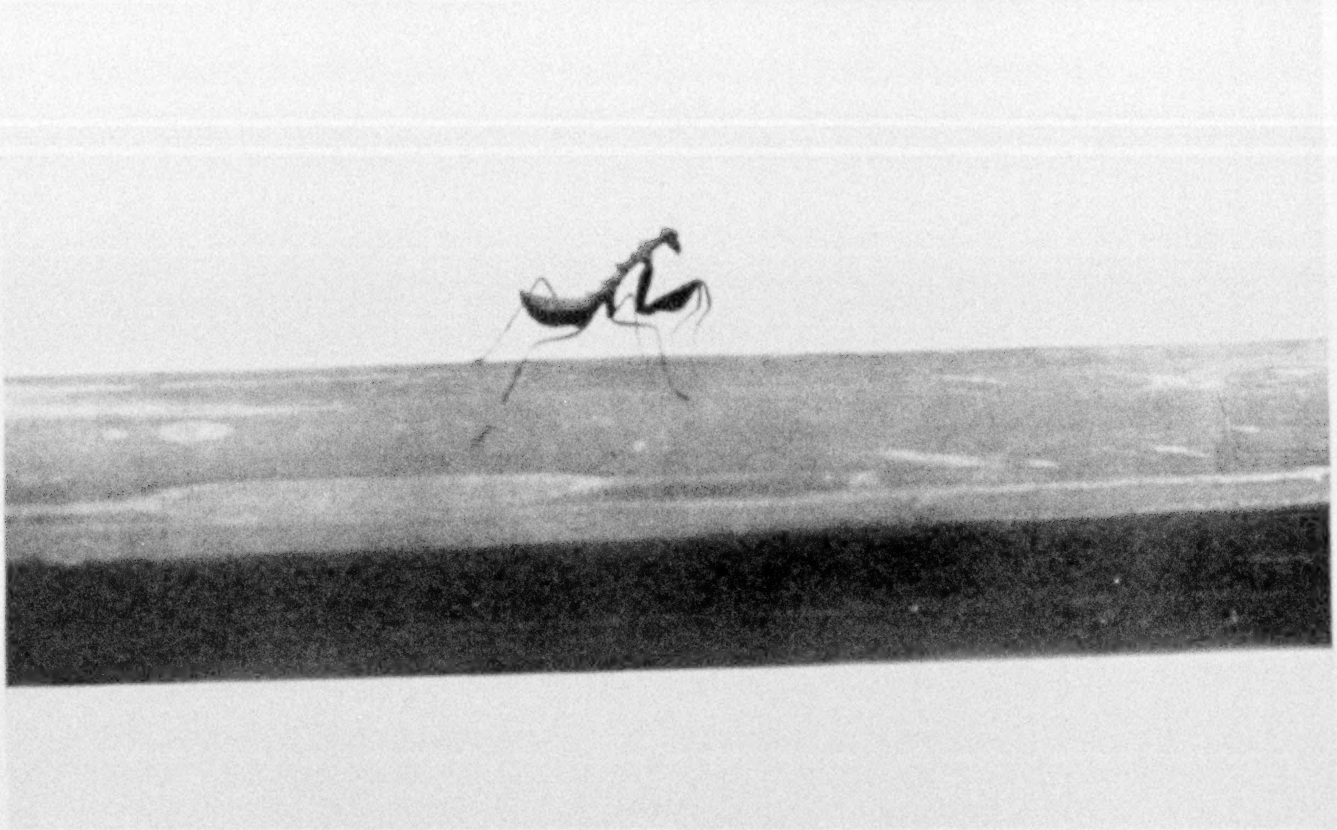
Few people have ever reached the summit of Tungurahua, and even those who have ascended during periods of inactivity have not accomplished as much as we were able to do. Two ascents on two consecutive days, with an eruption thrown in, is a record which will not be challenged for some time.

We now bade farewell to the ice and snow of the mountains and plunged into the great equatorial forests of Amazonia in search of Sumacu, an isolated peak which lies out on the Amazon plains, completely detached from the main cordillera of the Andes. It is one of the most remarkable physiographic features in this part of South America and rightly deserves the name by which it is known to those brown shadows of the forest who live in jungle solitude around its base.

Sumacu Urcu means in English Beautiful Mountain. For centuries this great cone, rising steeply out of the plains, has been admired by every traveler descending the River Napo, and I have frequently wondered why no man has ever been tempted to solve its secrets. Its exact geographical position was determined by Sinclair and Wasson in 1921, but prior to our visit we knew of no written record that any human had ascended it or even explored around its base.

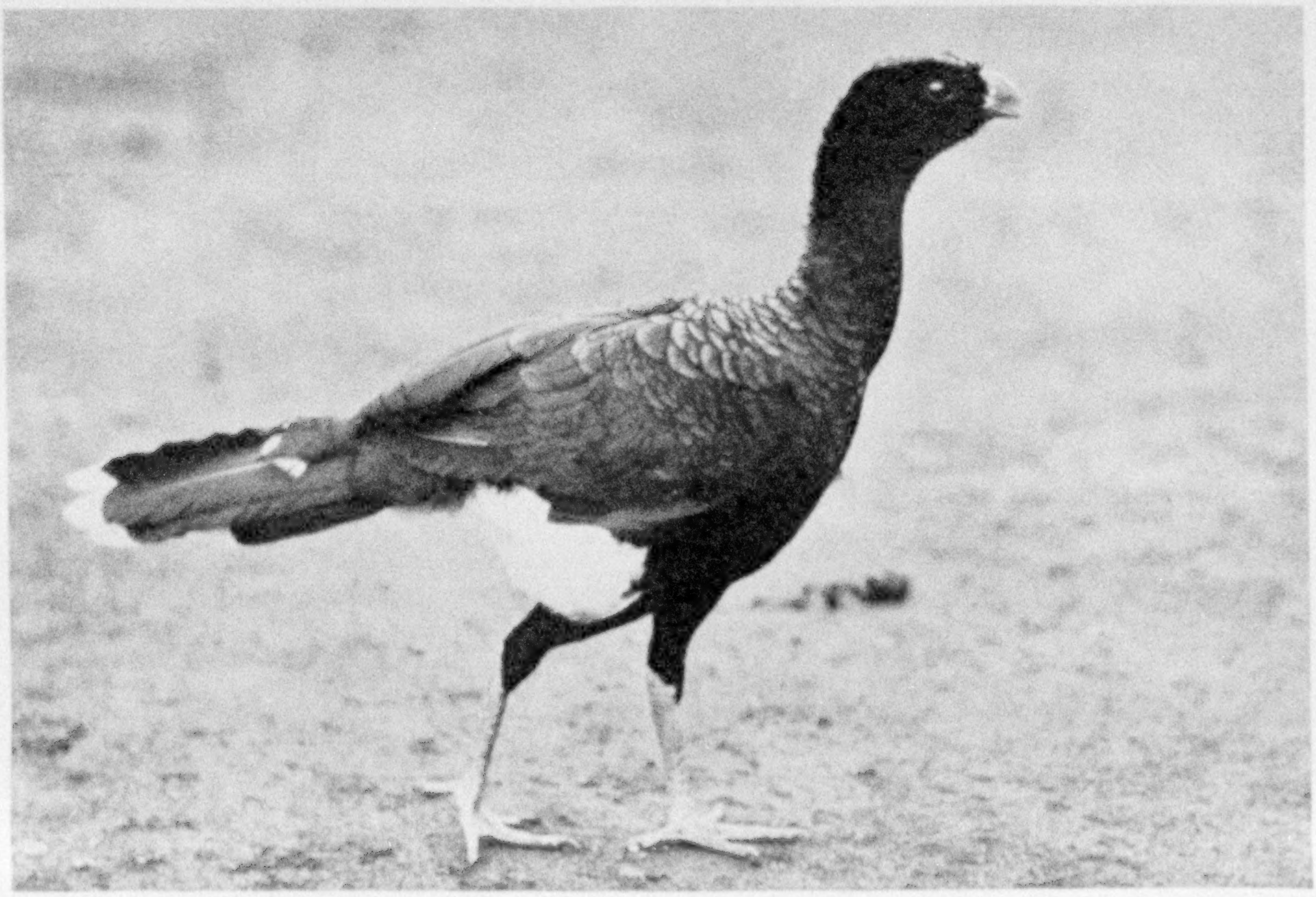
As a spectacular feat, the climbing of Sumacu cannot rank high, but the approach through dense virgin forests and the scaling of its thickly wooded sides represent a series of difficulties more real than apparent.

After leaving Baños, Johnston and I traveled over devious trails. We visited the Jivaro Indians, those warlike fellows, who have the habit of removing the head of an enemy and shrinking it down to the



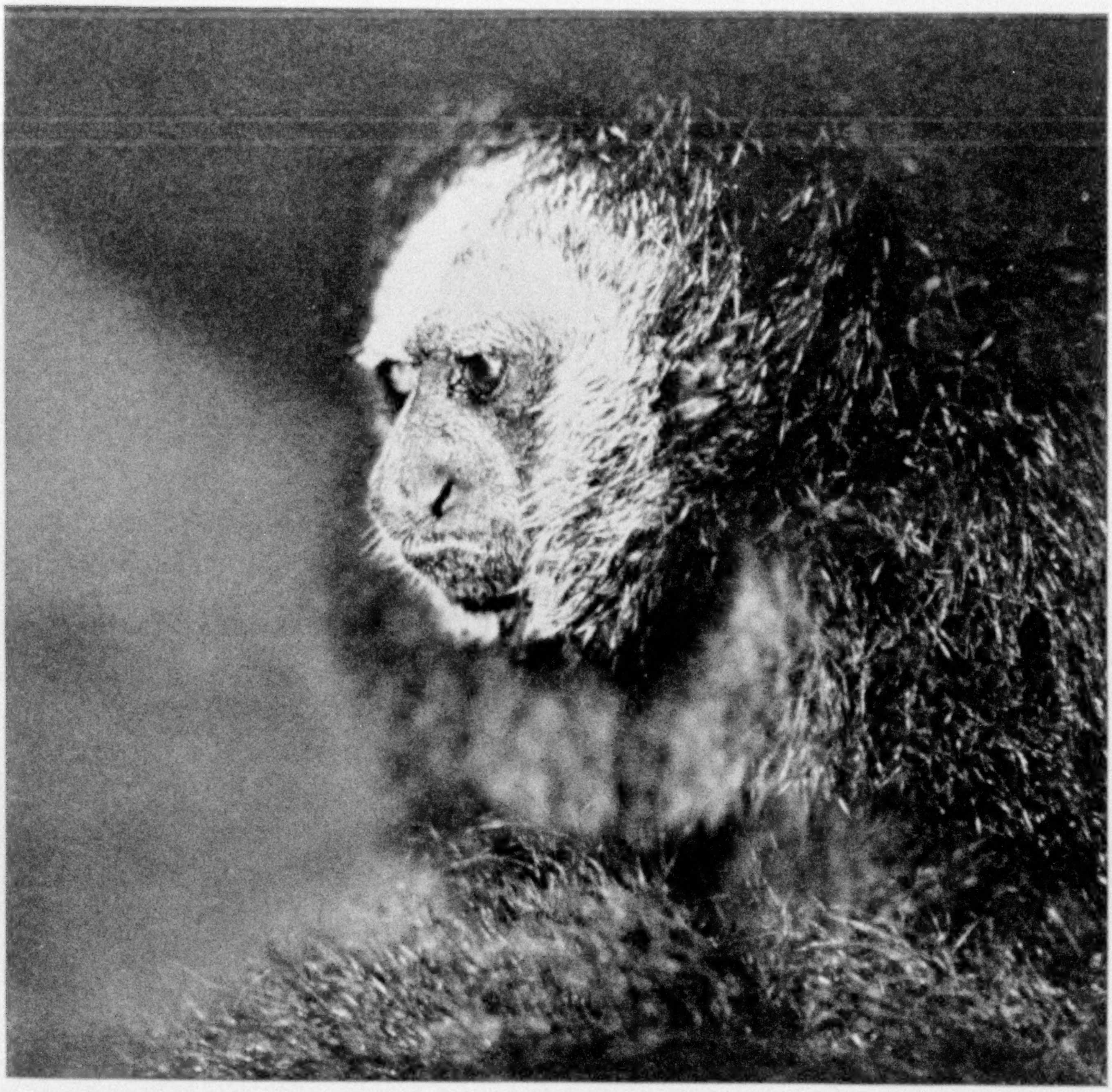
HER ATTITUDE OF PRAYER CONCEALS A SAVAGE NATURE

The praying mantis, a lone meat-eater in a large family of vegetarian insects, assumes an attitude which suggests to human eyes a devout nature, and lies in wait for her victims. So savage is this insect Amazon that after the mating season she calmly devours her husband.



THE JUNGLE TURKEY PROVED A WELCOME ADDITION TO THE EXPEDITION'S LARDER

The feathers of this magnificent bird are bluish black and white and the beak is a dark orange color. A pronounced crest can be raised on the head at will. The meat is white and tender and highly esteemed by the Indians.



"GRANDPAPA" DISAPPROVES

The hairy saki, small and ferocious-looking denizen of the Amazon jungle, became known to the author's party as "Grandpapa" because of his serious expression and his long gray-tipped hair. He was encountered en route to Mount Sumacu.

size of an orange, as a souvenir of the chase. But others have described this tribe.* Suffice it to say that after many trials we arrived in the village of Napo, which lies crammed up against the great rock wall of the Andes, on the banks of the Napo River.

We descended this river in a large dugout chartered from a trader in the locality, and after five days of easy going we turned into a northern tributary, the Payamino, up which we proceeded at the average rate of nine miles a day, until on the fourth day we reached a collection of Indian huts. At this remote spot we started our long trek through dense forests which spread around the base of Sumacu.

MIGRATORY INDIANS MAKE TRAVEL DIFFICULT

While in Napo making arrangements for transportation downriver we heard that José Schweitzer, a trader, accompanied by two padres from the mission at Tena, had just ascended Sumacu. This news came as a keen disappointment to me, for I had hoped that my small party would be the first climbers. Instead, I had

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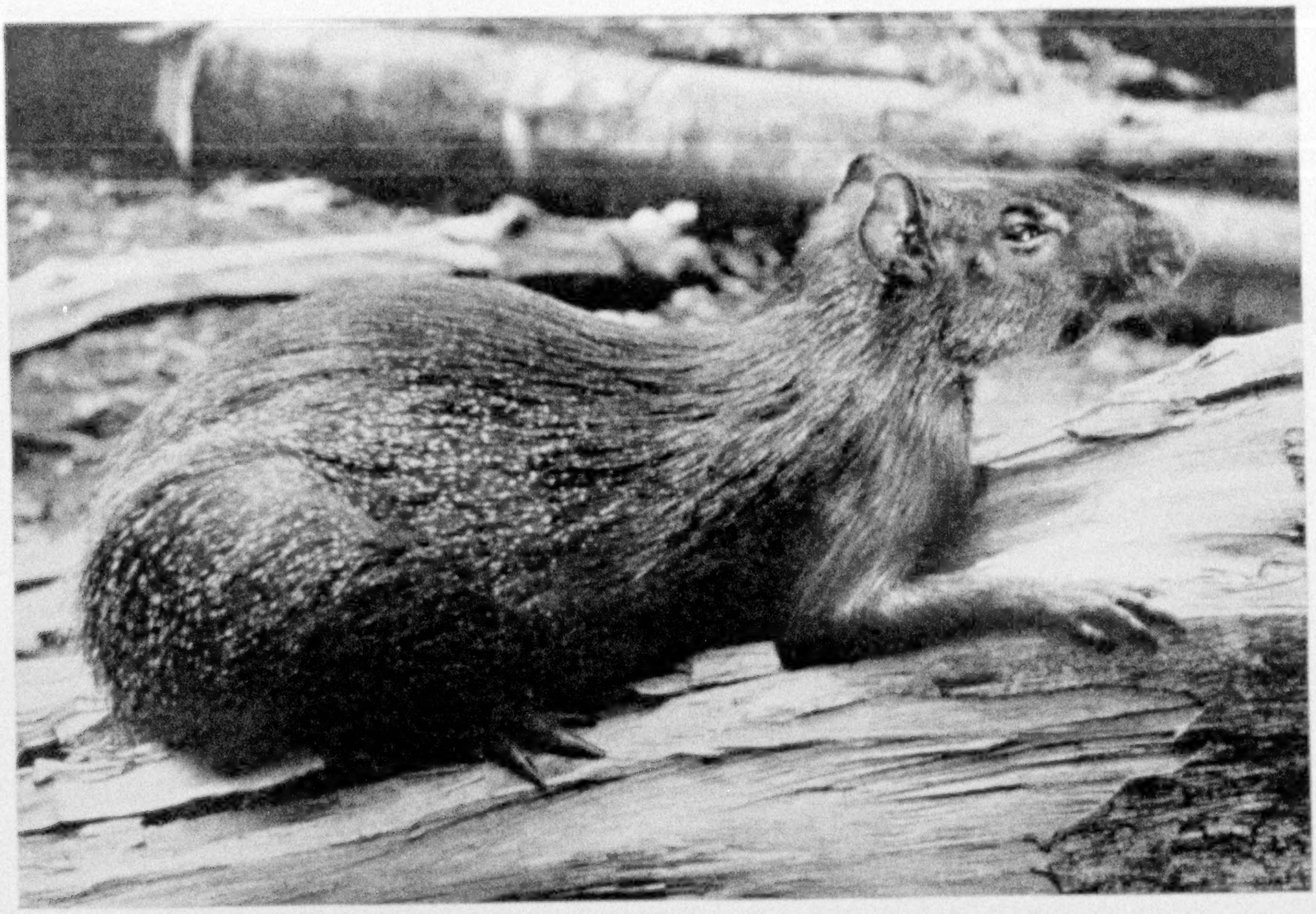
* See "Over Trail and Through Jungle in Ecuador," by H. E. Anthony, in the NATIONAL GEOGRAPHIC MAGAZINE for October, 1921.



INDIANS HUNT THE AGOUTI FOR HIS PALATABLE FLESH

This rodent is about the size of a rabbit and lives for the most part in the jungle. It can run very fast, and the Indians think that by eating the meat they will acquire some of its speed. These animals make destructive raids on the yucca plantations, which provide the staple food for the natives.

to take off my hat to Schweitzer and his enterprising band, relegating my companions and myself to second place. It was our good fortune to fall in with Schweitzer later on, and he joined our party in the capacity of guide, philosopher, and friend.

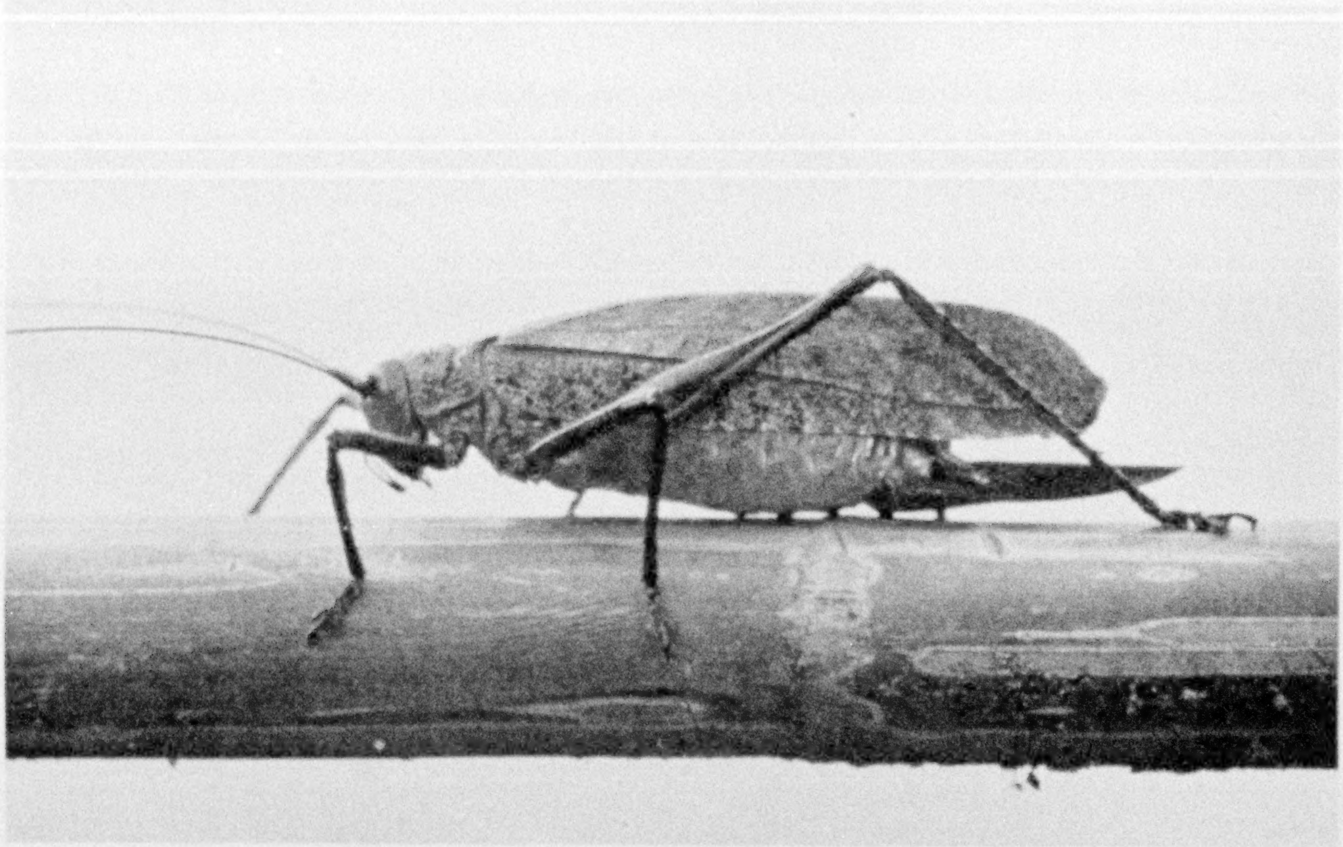
The one great difficulty we experienced in traversing this area was the scarcity of Indian inhabitants. In spite of the extraordinarily healthful nature of the region, there were few families occupying it, and those that did were as difficult to lay hold of as eels. They were here to-day and gone to-morrow, apparently dividing their time among numerous habitations hidden away in the deep recesses of the jungle. Out of possibly 28 Indian houses which we encountered, not more than six were occupied.

On early maps of South America names like Loreto, Avila, and San José are prominently marked; and, although they persist on the more up-to-date renderings of this particular area, they stand for nothing except a few dilapidated huts occupied at odd intervals by the denizens of the jungle. No white man or even a half-caste lives nearer than the banks of the River Napo.

From the start we were handicapped by lack of porters. We employed men, women, and children. After one group of carriers had left us we might well have remained in the forest indefinitely had we not accidentally stumbled across a Huaynaro, or head Indian. He exercised some sort of control over all the forest dwellers, who seemed to appear and disappear among the trees like so many phantoms. Owing to his efforts, we eventually started.

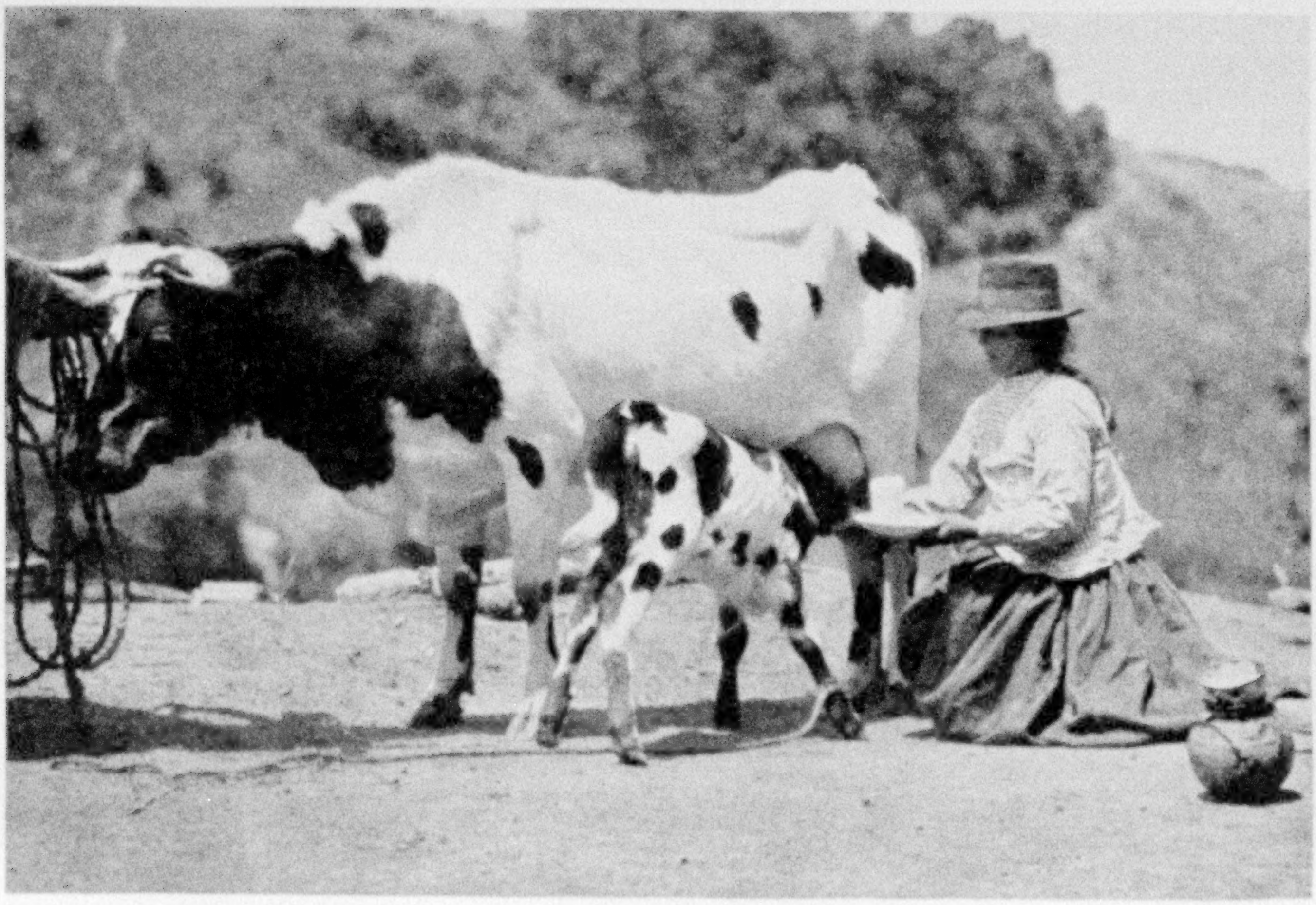
An Indian track ran westward from San José toward the Andes. It passed fairly close to Sumacu, and along it our party traveled in company with eight cargo-bearers, three of them women. Constant downpours made the rivers well-nigh impassable and provided some thrilling experiences for Johnston, Schweitzer, and me.

The route we followed was a long series of switchbacks, with a final terrific slant up to the crest of Sumacu itself. We



GRASSHOPPERS SOMETIMES FLAVORED THE AUTHOR'S SOUP

Hordes of these insects made themselves objectionable to the members of the expedition by continually jumping into the food. They attain a length of four and one-half inches.



HALF-AND-HALF

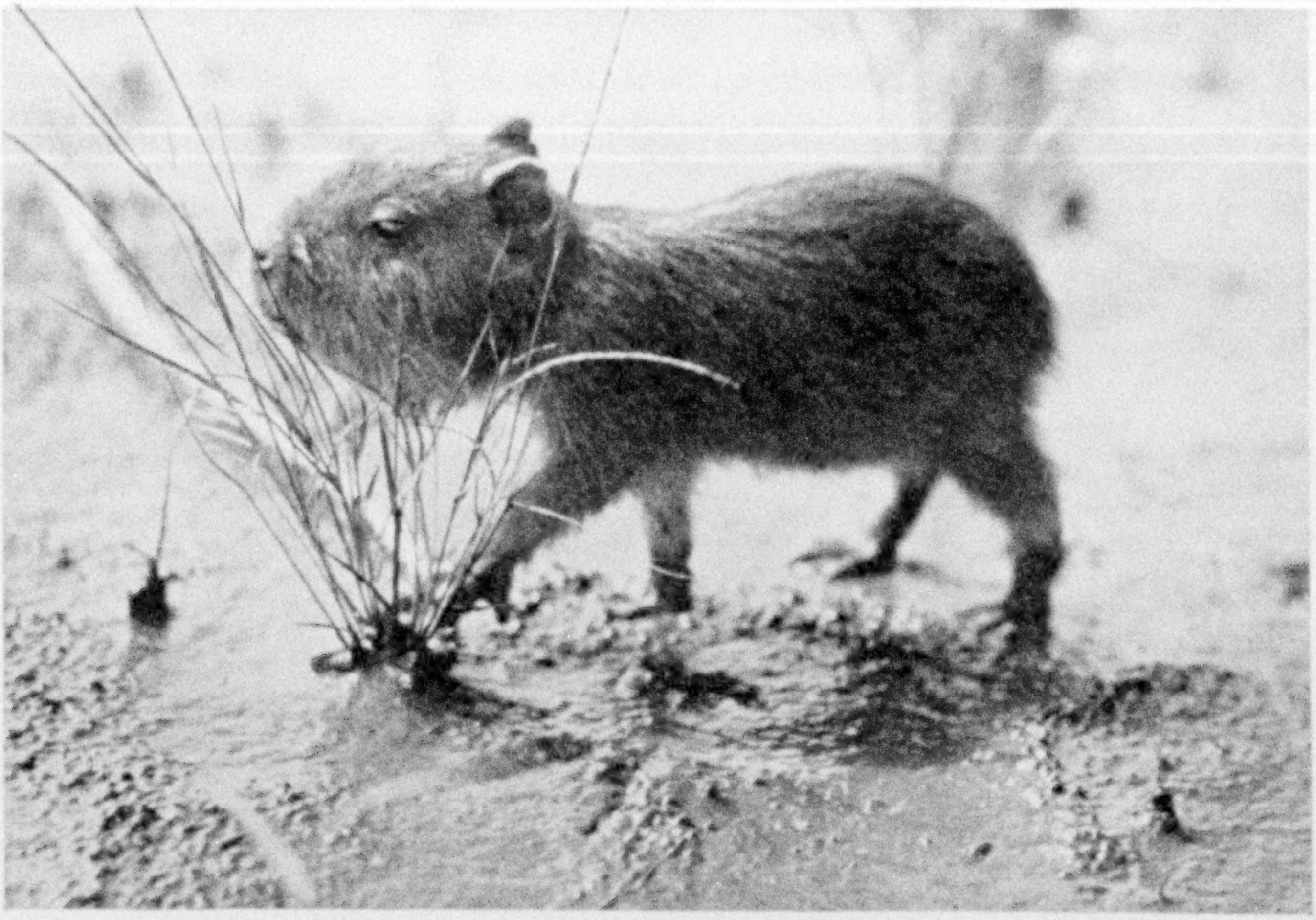
The cow would not allow herself to be milked unless her calf were brought alongside simultaneously. Then the Indian woman and the calf took turns at milking until everybody was satisfied, with a minimum of trouble.

THE BABY OCELOT SPEAKS MUCH THE SAME LANGUAGE AS ANY OTHER KITTEN

A New World member of the cat family enjoys distinction both for its beauty and its amiability. This youngster, caught in the jungle near Sumacu, was taken to the London Zoo.

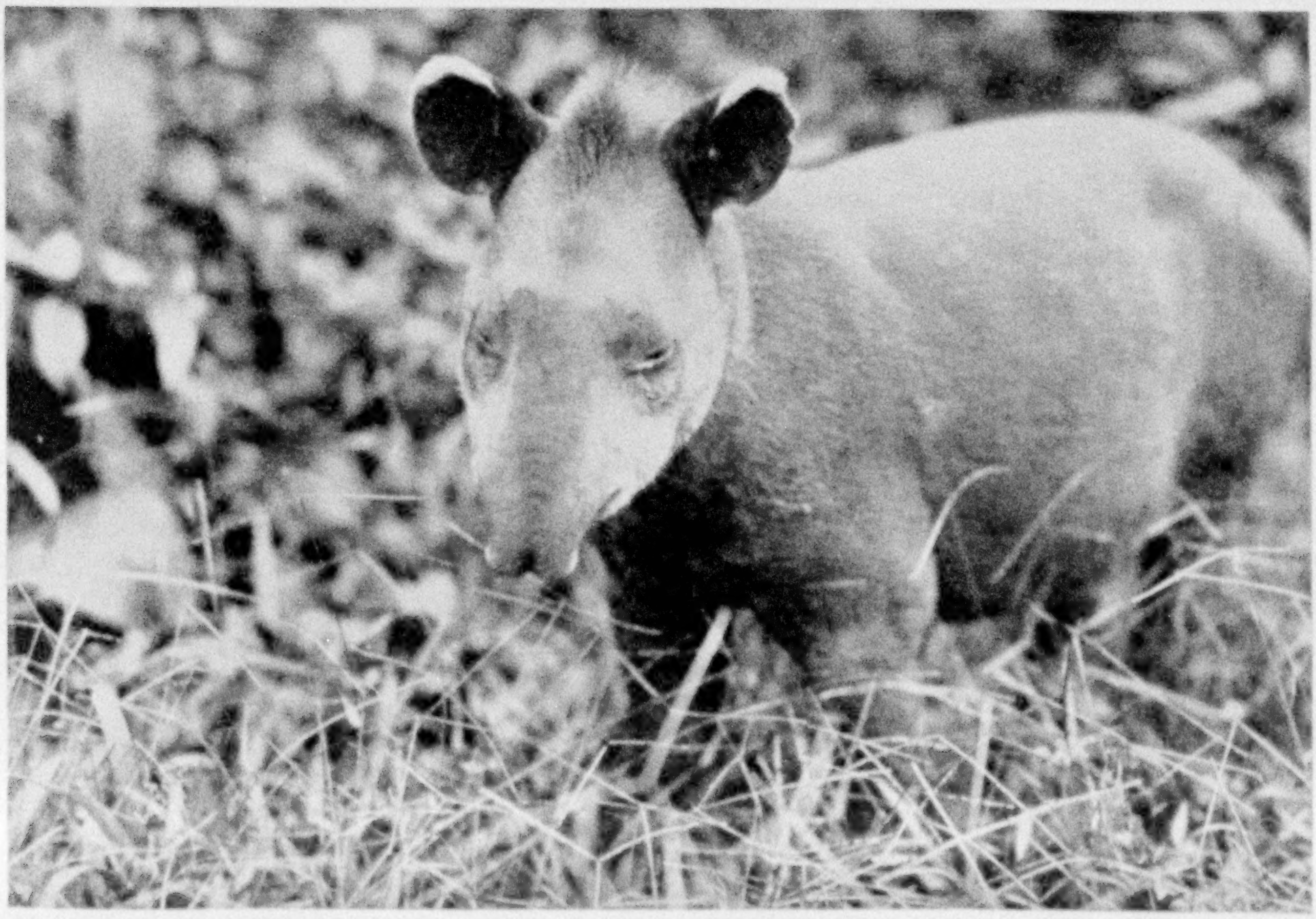
HE HAS TO BE EVER ON GUARD AGAINST THE TERRIBLE JAGUAR

Although no match for the jaguar as a fighter, the tapir sometimes escapes that animal's attacks by tearing madly into the dense jungle and sweeping his assailant from his back. The baby tapir will lose nearly all his white markings as he grows older.



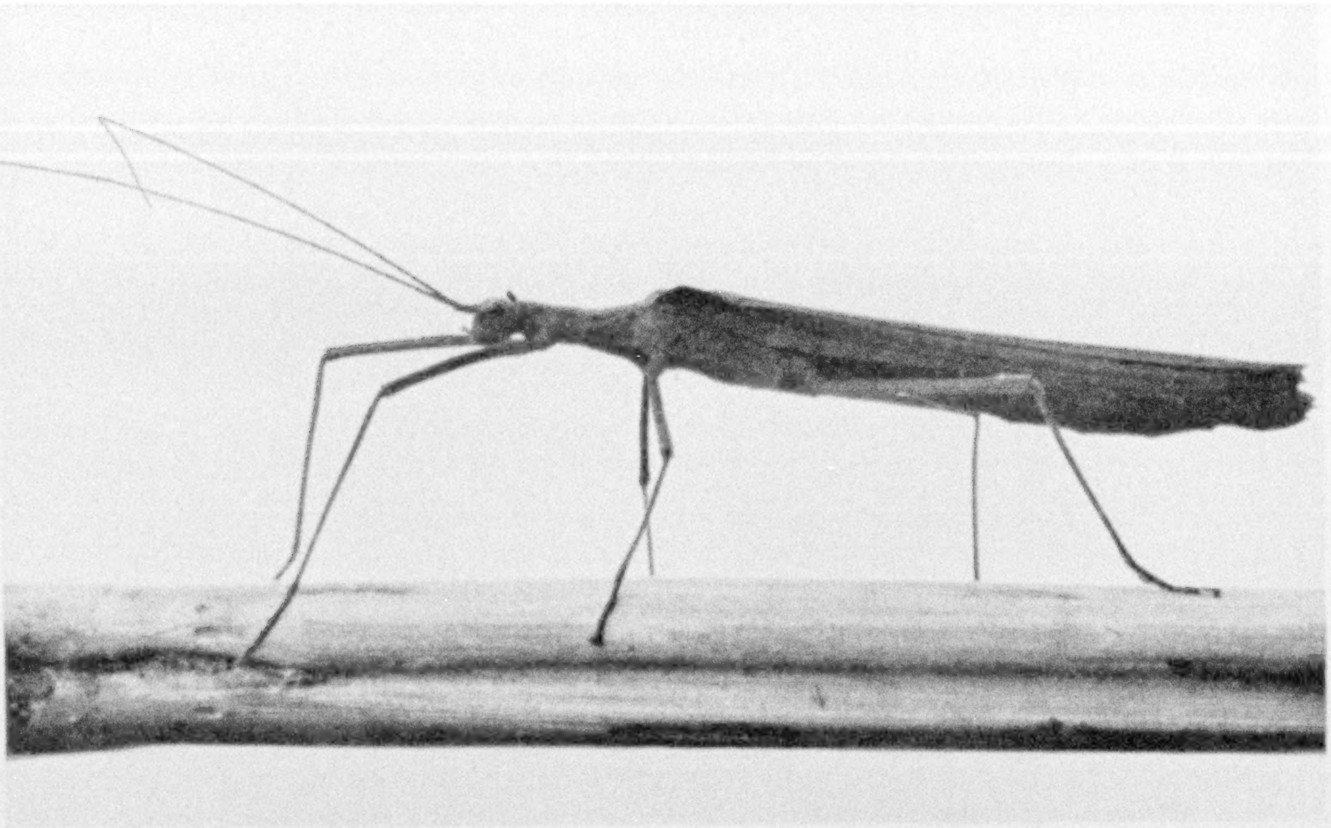
THE CAPYBARA IS THE LARGEST OF ALL RODENTS

He has no tail and his feet are webbed. He is equally at home in water and on land. The young animal shown in this photograph will grow to be as large as a small pig.



AN INOFFENSIVE DENIZEN OF AMAZONIA'S FORESTS

Tapirs, like all the other game on the slopes of Sangay, seemed unafraid of man and could be approached as close as fifty feet without taking alarm. These strange animals live in the seclusion of dense woods, usually near the water, to which they retreat from their enemies.



AN INSECT MASTER OF THE ART OF CAMOUFLAGE

The phasmid, or stick insect, resembles a light green twig. So marked is this similarity of appearance that it is difficult to distinguish him from the tender shoots of the plants from which he dangles. He grows to a length of three and a half inches.

spent many nights in the jungle, camping under palm-leaf shelters, and we made our last camp at an elevation of 7,000 feet.

At 10 o'clock one morning we started the real ascent, a steady climb through a great variety of vegetation, in places so dense that we regretted we were not blessed with the prehensile tails of the monkeys about us.

The worst stage of the ascent was a tangled mass of shrubs so thickly matted that it was impossible to thrust a foot through the springy surface or to obtain a secure foothold on top of it. We were therefore obliged to depend on the gripping power of our hands to hoist and haul ourselves up.

Within 500 feet of the top this particularly aggravating growth thinned out and was replaced by coarse grass, over which it was comparatively easy to proceed. Schweitzer, Johnston, and I were well in the lead and by 5:30 in the afternoon had reached a bare shoulder 200 feet from the crest.

The boys, who had been struggling with cameras, had lagged so far behind we could not even see them. Accordingly we called a halt and, as it was exceptionally cold, gathered a few dry twigs from some dead dwarf shrubs to make a fire.

The sun sank below the horizon and the temperature went with it. Johnston said he heard the thermometer hit zero; incidentally, he looked as if he had. Our miserable fire had no more heat in it than a firecracker. We shouted in chorus to our Indians, somewhere down the mountain side. There was no response, and we shouted again.

Meanwhile I took compass bearings on points of interest, including Antisana. We seemed to be due east of it. This, however, did not allow for magnetic variation, which Sinclair and Wasson determined to be 5° 43′ E. at the village of Napo. As darkness settled, and none of us relished the idea of being frozen to death at 12,700 feet, there was nothing to do but descend to a slightly warmer elevation for the night. Eventually we heard our men and within a short time we were all united.

WE BURROW INTO THE MOUNTAIN TO SLEEP

Have you ever watched a dog burrow in the ground, throwing the dirt back with his feet? That is just what we did on the side of Sumacu. The ground was so steep that it was barely possible to sit down without rolling over; so we had to scoop out a niche in the side of the mountain.

We worked like madmen, tearing up the shrubs with our fists, slashing the surface soil with knives and scratching it away with our hands or anything that was convenient. Eventually, with our staffs stuck in a row at a good slant and our waterproof sheet hanging over them, we crawled underneath — Indians, white men, and baggage all jumbled together.

That was a pretty bad night and none of us complained when morning broke, even though it broke wet. Our few possessions were bundled up and at 5:30 the porters headed for camp, while Johnston and I, with the rain in our faces, began again to clamber upward and eventually reached Sumacu's summit. Mist and rain prevented our making many observations of importance, but we studied the peculiar contour of the peak and collected specimens of the outcroppings at our feet.

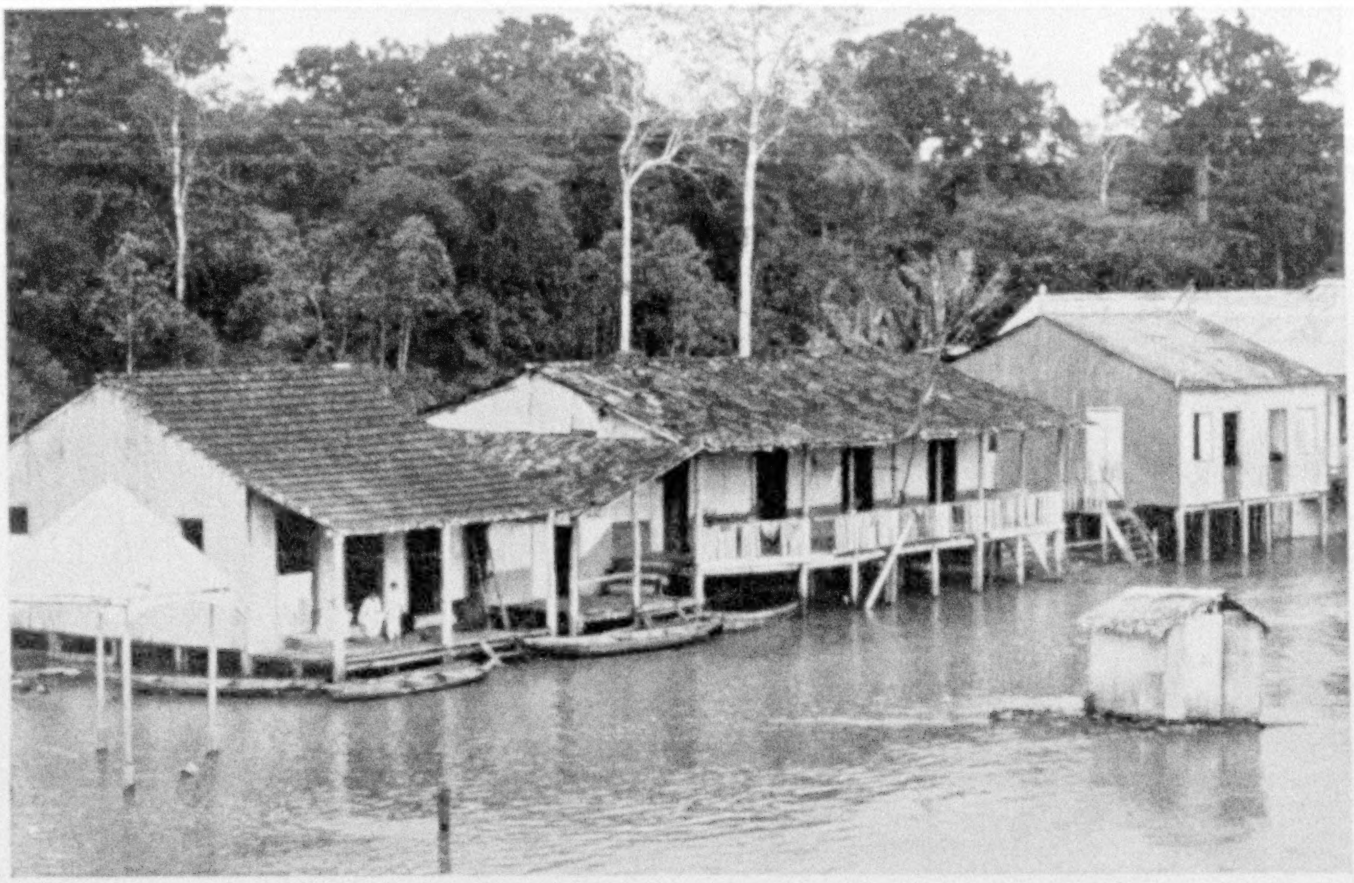
"MR. RACE HORSE BROWN" POSES FOR THE CAMERA

The pet of the party, a Humboldt's woolly monkey, deserved his name. "Race Horse" was applied because he moved so slowly, "Brown" because of his color, and "Mister" because it seemed more respectful than calling him plain Brown. He dined on fruit, with an occasional grasshopper or spider as an extra relish when he was fortunate enough to catch one.

Sumacu is an extinct volcano. The crater is perfectly formed and shows little sign of erosion or weathering. The rim is highest on its northwest corner, and, like Sangay, gives evidence of a much larger crater having occupied the entire mountain top in years past. The present bowl is formed some 200 feet above the old crater and is about 1,200 feet across and 300 feet deep.

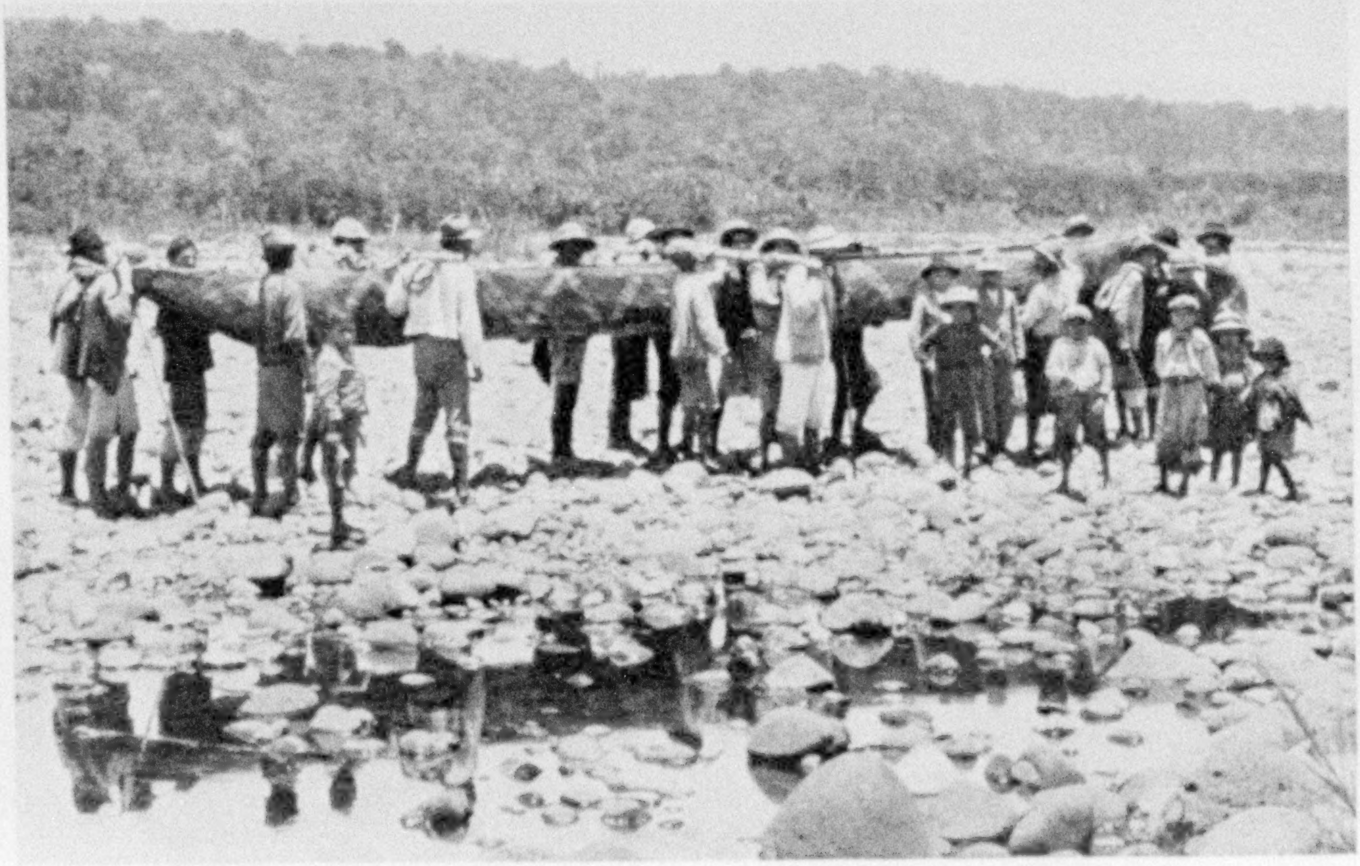
Heavy rain and mist prevented our taking a single photograph. Both our still and motion-picture cameras had been lugged up all the way from the plains, and yet not a foot of film was exposed; so, in this respect, our raid on Sumacu proved a complete failure. It was just noon when we again set foot in camp, and in the luxury of food we tried to forget that for a day and night our only nourishment had consisted of a handful of beans.

By forced marches over hills and through rivers, we reached the banks of the stream



A VENICE OF AMAZONIA DURING HIGH WATER

When the River Javary is at the flood stage, the only means of getting about the villages on its banks is by canoe. In the dry season the edge of the stream is 60 feet distant.



THE RIVER WENT AWAY AND LEFT THEM

One of the vicissitudes which beset a traveler by dugout in Amazonia is the uncertainty of the rivers. He may tie up at night alongside a bank, pitch camp, and when he wakes next morning the level of the river may have fallen and he will find himself 100 yards or more from the main channel. If he cannot obtain native help in moving his crude, heavy canoes, he sometimes remains stranded for months before the river rises and sets him free.

up which we had come in our big canoe. The men we were relying upon to build a raft upon which to float down to the Amazon had disappeared from their huts, and the men who had accompanied us to Sumacu and back refused to do any more work—not that we had treated them badly, but, in their estimation, two months was as long as any good Indian should work in two years So they left us, all smiles, and with a solemn promise to send other men in three days to help us out of our predicament.

For weeks we waited patiently on the bank of this little-known stream, but the promised Indians who were to assist us in the construction of our raft never turned up.

A FATEFUL DELAY

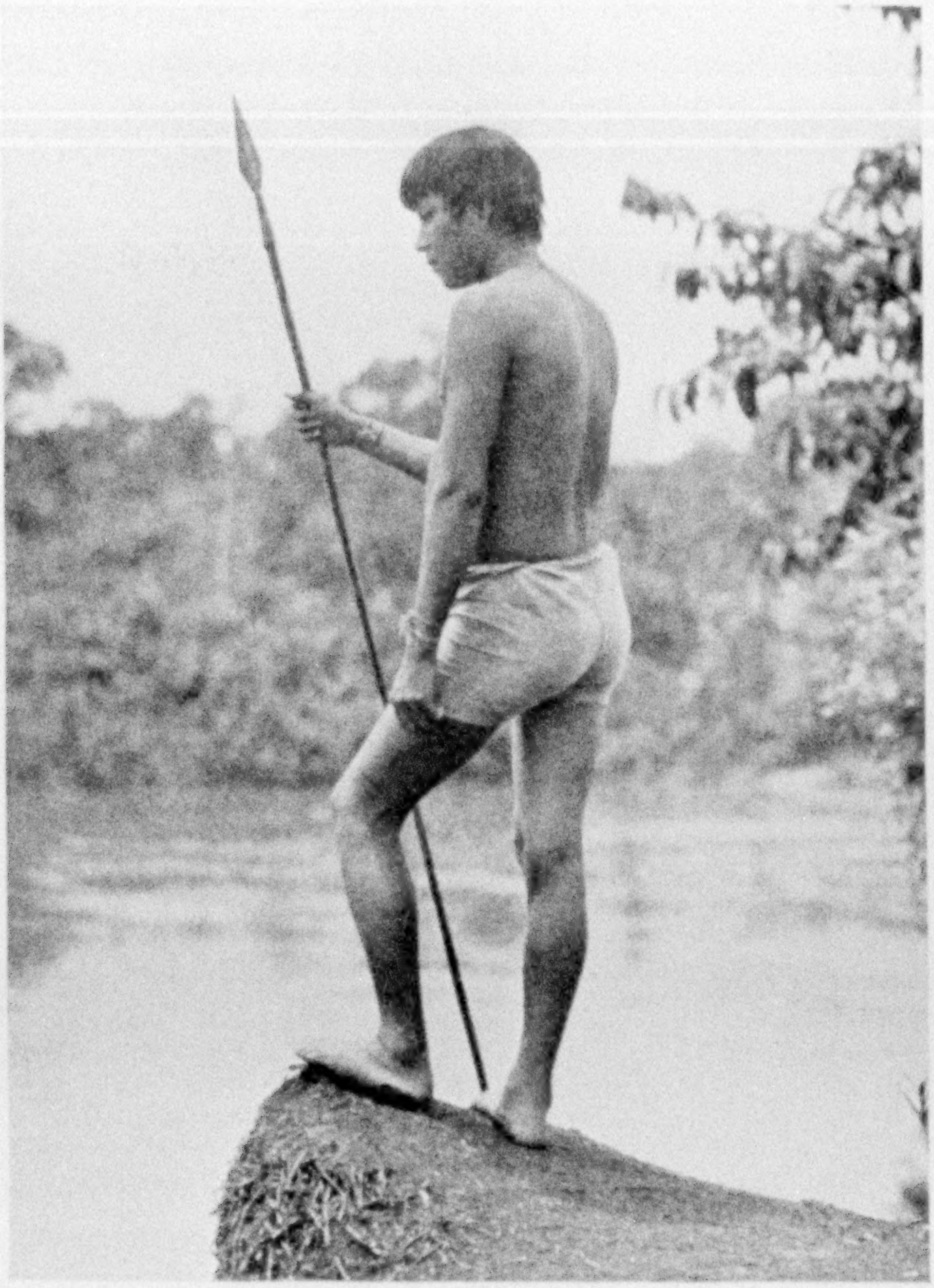
It began to look like a hopeless situation until one day we accidentally ran across a canoe full of Indians. Through generous gifts of knives and cloth, we persuaded them to work for us.

After four weeks of faithful labor a huge floating platform, neatly roofed and floored, was ready for its maiden voyage. The very afternoon the work was completed clouds gathered and rain fell heavily. We decided to postpone our departure until the morrow. There was no advantage in leaving our shack on land, for after all, the loss of another day would not matter.

How it did rain! Not for a moment did the downpour cease. All night long it was drumming on the roof of our shack. Lightning crackled over the tree tops in an endless display of vivid flashes and the thunder rumbled incessantly from one end of the world to the other.

By 7 o'clock the next morning, however, the atmosphere had cleared and the sun shone forth on the dripping jungle. We packed our kits and after breakfast sauntered leisurely down to the river to admire our raft and arrange for stowing the baggage. To our dismay, we found that the river had risen 21 feet. The raft, which had taken us four weeks to build, was gone! The forest giant to which it had been moored had likewise disappeared. The whole river bank had been swept away by the ravenous waters.

There was no alternative but to start



A NIMROD OF AMAZONIA

The Indians who came downriver with the author on his raft were good huntsmen. They carried with them a small supply of food, but depended mostly on such game as they could bring down with their spears or, when opportunity afforded, with the white men's firearms.

ON SAFARI IN THE JUNGLE

Few parts of the world are as little known as the great tracts of river-traversed forest lands in the heart of the South American Continent.

work afresh. After we had distributed more knives and cloth, a second raft was put on the stocks. Three weeks were required to complete it. When it was finished, without losing a moment, we jumped on board and set float downriver (see illustration, page 92).

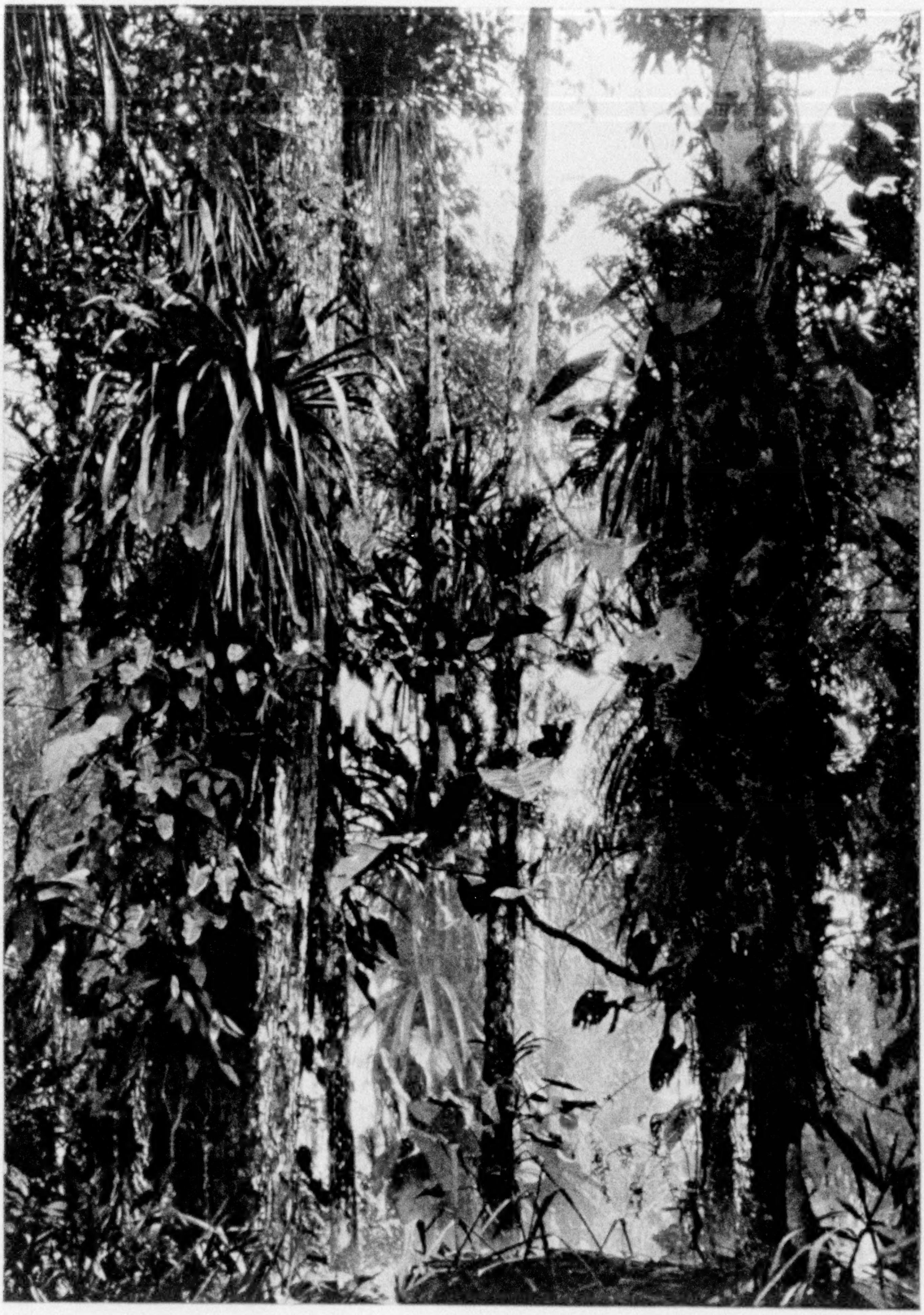
The water was now low, and within four hours we came to rest, firmly wedged on some rocks in midstream. We remained jammed in this awkward position for some time, waiting for the river to rise.

A flood eventually came in the middle of the night and we floated free. We went careering madly downstream between high walls of green foliage, but with a full moon overhead. For two hours we literally battled for our lives, and it was with grateful hearts that we ultimately sighted a gravel bar alongside which we could tie up in safety.

From this point all was smooth going. The swift current shot us down the Payamino, out into the wide and sluggish waters of the Napo; and then we drifted along lazily day after day for several hundred miles.

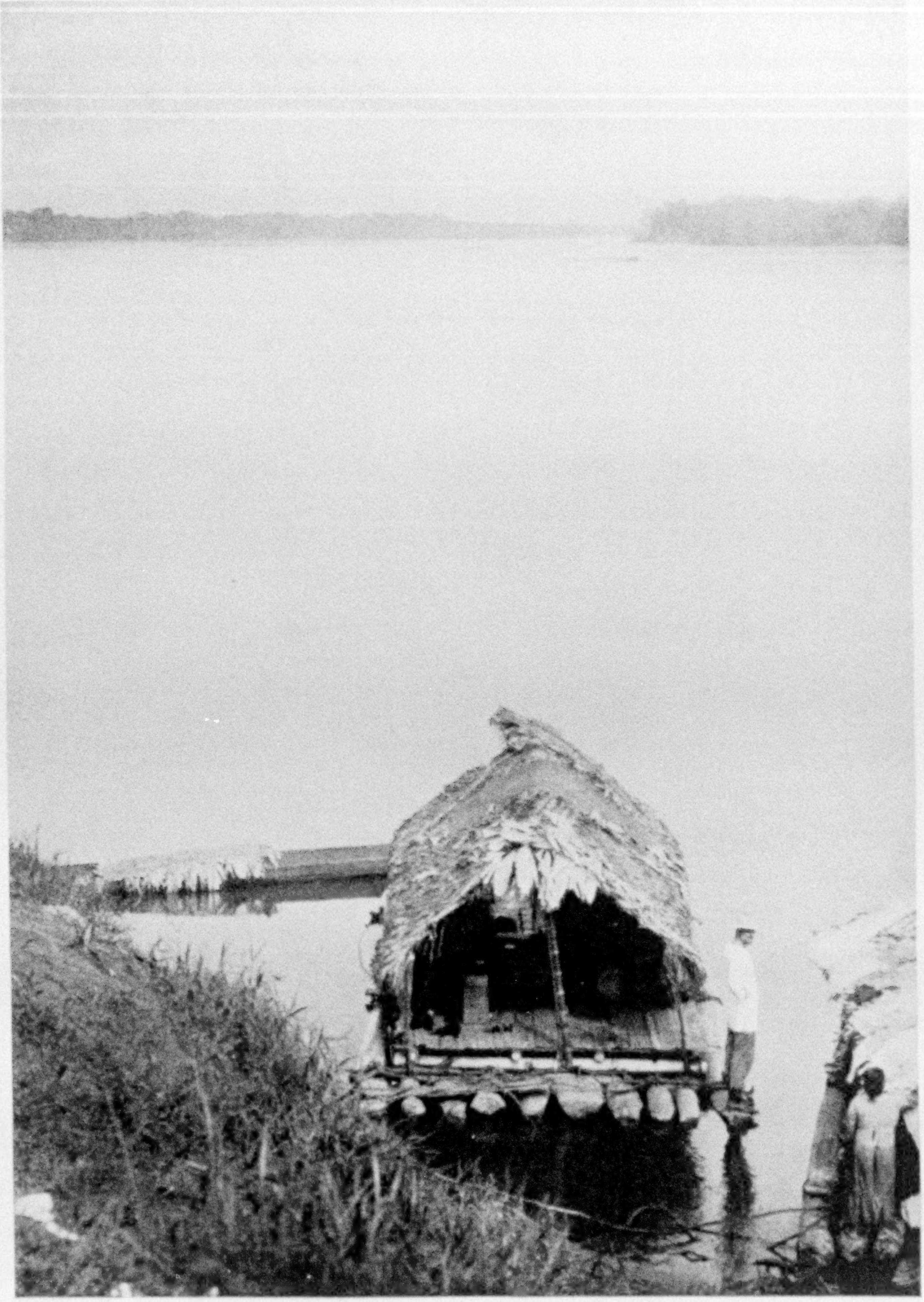
We hailed the first launch we met bound for Iquitos, and then traveled by river steamer to Manáos, where we stepped on board a comfortable modern steamship.

So, in the lap of luxury, we concluded our long trek across the South American



TREES IN AMAZONIA ARE OFTEN LOADED WITH PARASITES

Although several trees appear in this illustration, hardly any of the leaves visible belong to them. Practically all of the foliage is parasitic and growing on their trunks.



TRANSPORT DE LUXE ON THE RIVER NAPO

Three weeks were consumed in building this floating platform and roofing and flooring it for its voyage down a wide and sluggish northern tributary of the Amazon. Its predecessor was swept away by a flood (see text, page 89).

INDIANS OF THE ECUADORIAN JUNGLE

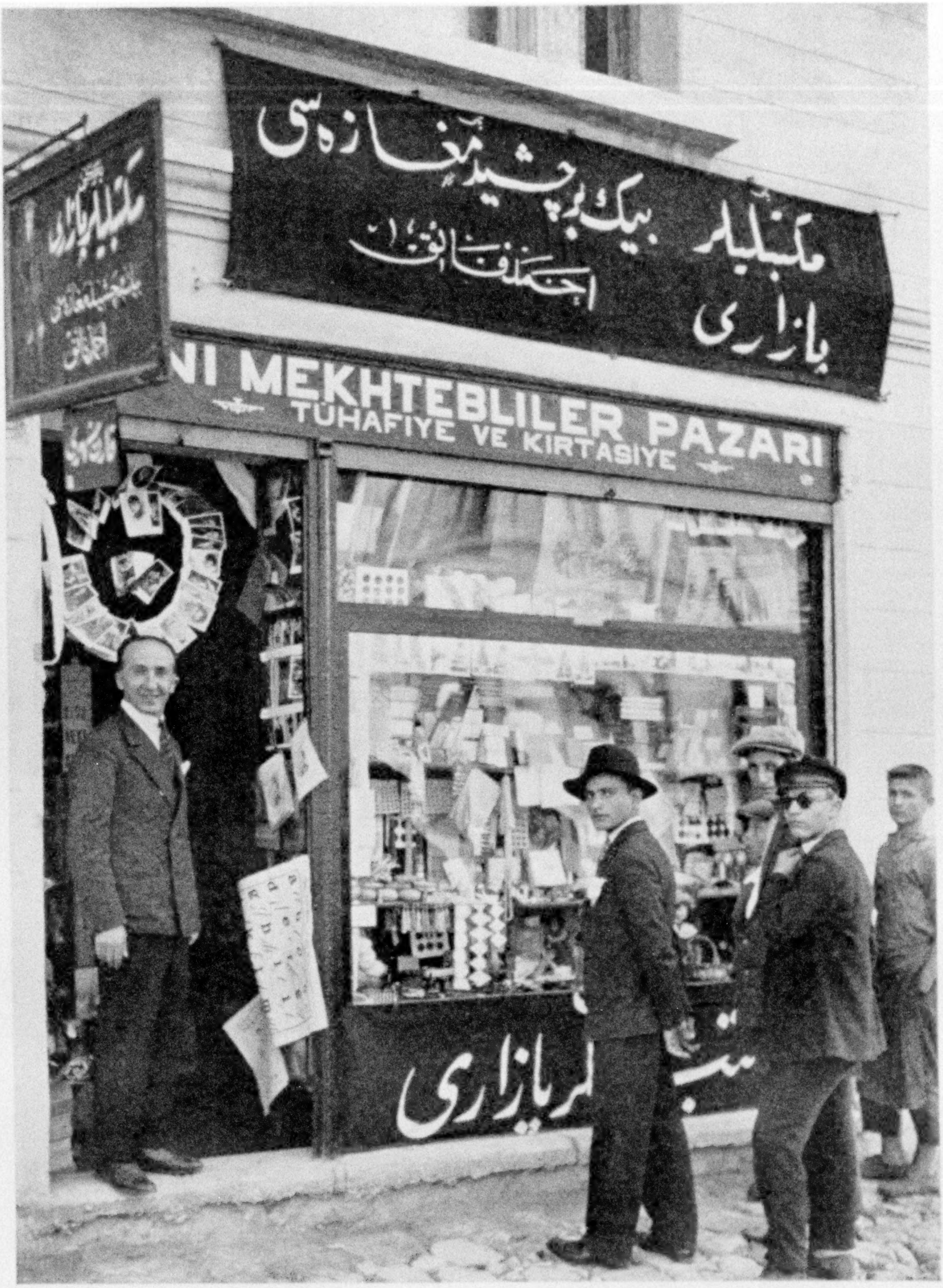
When the author and his companion started off downriver on a raft for the return to civilization, they were accompanied by two canoes containing the families of the Indians working for them. When the raft was abandoned, several hundred miles downstream, the Indians returned to their forest homes in these canoes.

Continent. Our numbers had been increased by the addition of sundry animals which we had collected for the Zoölogical Gardens in London. We had also gathered valuable data, and last, but not least, an unusual collection of still and motion pictures, so that others might enjoy all the wonderful sights we had seen without any of the discomforts or vexatious delays which it had been our lot to experience.

THE "MAP OF DISCOVERY" OF THE WESTERN HEMISPHERE WITH THIS NUMBER

As a supplement with the January number, the National Geographic Magazine presents its readers with the fifth and last of the reproductions in colors of the notable series of mural paintings executed by the American artist, Mr. N. C. Wyeth, for the headquarters of the National Geographic Society in Washington, D. C. The four murals, which were reproduced in 1928 and issued as supplements, were: "The Discoverer," "Commander Byrd at the North Pole," "The Caravels of Columbus," and "The Map of Discovery of the Eastern Hemisphere."

A limited edition of these notable color subjects, unfolded, is available to members at the following costs: "The Discoverer," size 10 x 32 inches, $1.50 unframed, $7 framed; "Commander Byrd at the North Pole" and "The Caravels of Columbus," size 10 x 13½ inches, each, $1 unframed, $5 framed; "Map of Discovery," Eastern and Western Hemispheres, 16¾ x 18½ inches, each, $1 unframed, $6 framed. Special frontispieces, "Fate Directs the Faltering Footsteps of Columbus," 10 x 13½ inches (from a painting by Alfred Dehodencq), and "Vasco da Gama at the Court of the Zamorin of Calicut," 9½ x 12 inches (from a painting by José Velloso Salgado), each, $1 unframed, $5 framed. All forwarded prepaid in the United States and Canada.



THE OLD AND THE NEW TURKISH WRITING

This Constantinople shop displays its name in Old Turkish (Arabic script) above and then repeats its name in the recently adopted New Turkish (Latin letters). Both proclaim the fact that this is the "New Book Store." The shop is one much frequented by Turkish schoolboys, and its proprietor has been conducting a thriving business in the sale of new alphabets and primers during the last few months.

TURKEY GOES TO SCHOOL

By Maynard Owen Williams

European Staff Correspondent; Author of "Seeing 3,000 Years of History in Four Hours," "Unspoiled Cyprus," "In the Birthplace of Christianity," etc., in the National Geographic Magazine

With Illustrations from Photographs by the Author

IF THE pen is mightier than the sword, Turkey is on her way to new victories. The entire nation is relearning its A-B-C's, having discarded the 482-letter combinations of the Arabic script and adopted in their stead 29 characters (including those with diacritical marks) from the Latin alphabet, in use throughout the Western World.

When the schools closed for vacation last spring, there was little thought that the adoption of the "New Turkish alphabet" would delay their fall opening until textbooks could be prepared, so that all instruction would be in Latin characters. But the "New Turkish," no longer a joke, has been taken so seriously that a new humorous weekly, the *Khahaha*—the *k* is silent—which appeared in September, was the first periodical to be printed entirely in the new characters. On December 1, all newspapers were compelled to appear in the new alphabet, else suspend publication. The Government had to assist some papers to buy new type.

ARABIC SCRIPT BEAUTIFUL, BUT DIFFICULT

The Arabic script, apt medium for Moslem art, presented tremendous difficulties to the student; so that more than four-fifths of the Turkish people were illiterate.

Time and again I have found cultured Syrians, Arabs, and Turks unable to decipher the calligraphy which was both literature and art throughout Islam. Is it any wonder that the nearly 500 letter combinations of the Arabic script have long daunted worker and peasant?

In front of the highly revered tomb of Eyoub Ensari, standard bearer to Mohammed the Conqueror when he took Constantinople, there is a beautifully carved grill, bearing a wonder-working Arabic inscription. Mothers, pressing their palms upon it and then rubbing the faces of their children, keep its surface brightly polished. Yet few can read it and I have found none who can translate it (see illustrations, pages 99 and 106).

Cultured Americans who have lived for decades in Turkey cannot read the names of the landing stages on the way to their homes on the Bosporus. Men who can converse fluently in several languages cannot read the street signs in the land in which they have lived for years. But within the last few weeks a vast change has come.

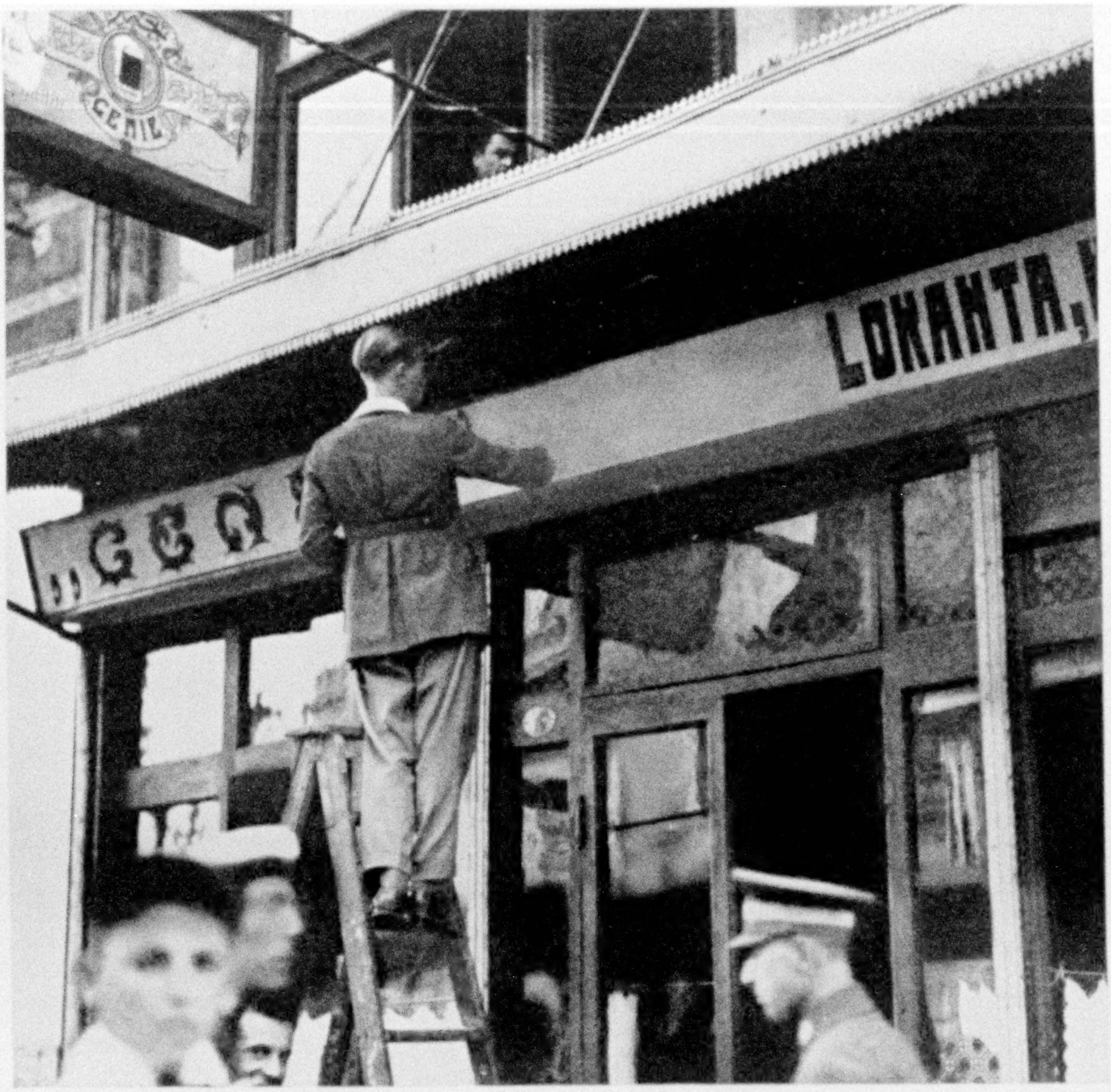
Early in August, on what seemed frivolous occasions, at one of which he praised Western music and Western dancing, the President of the Turkish Republic spoke in behalf of the new alphabet, whose adoption, like the coming of the millennium, was then something to be considered, but not worried about. As if by magic, however, names in Latin characters appeared on a dozen or so Turkish steamers in the harbor. As I passed along the quay of Galata Bridge, on August 21, a whole set of names was there, ready to be fastened to the prows of local steamers. I longed for my camera, which was miles away.

On the bridge itself, boys were selling copies of the new alphabet. On the steamer, with a ten-cent primer in hand, I learned more Turkish in an hour than I had known after a year in the country.

Although the popular enthusiasm is great and opposition negligible, it was a change imposed from the top—not enforced by law, but inspired by the President. At a banquet, while making a speech, he would hand his manuscript, written in "New Turkish," to some sluggish bureaucrat who felt secure in his job, and ask him to read it. Sweat glands were overworked last summer. One such application was enough for that officeholder. The morrow found him feverishly studying his A-B-C's.

GOVERNMENT MINISTRIES ADOPT NEW ALPHABET

One after another, the ministries are adopting the new alphabet for all official correspondence and none seems eager to be the last. The lowliest functionary must know how to read and write Latin char-



A RESTAURANT NEAR THE GALATA BRIDGE CHANGES ITS SIGN TO THE NEW TURKISH ALPHABET

The new system of writing in Turkey has affected not only the cheaper signs, but imposing and costly brass and bronze inscriptions in Arabic script are being discarded and replaced with names in the Latin alphabet.

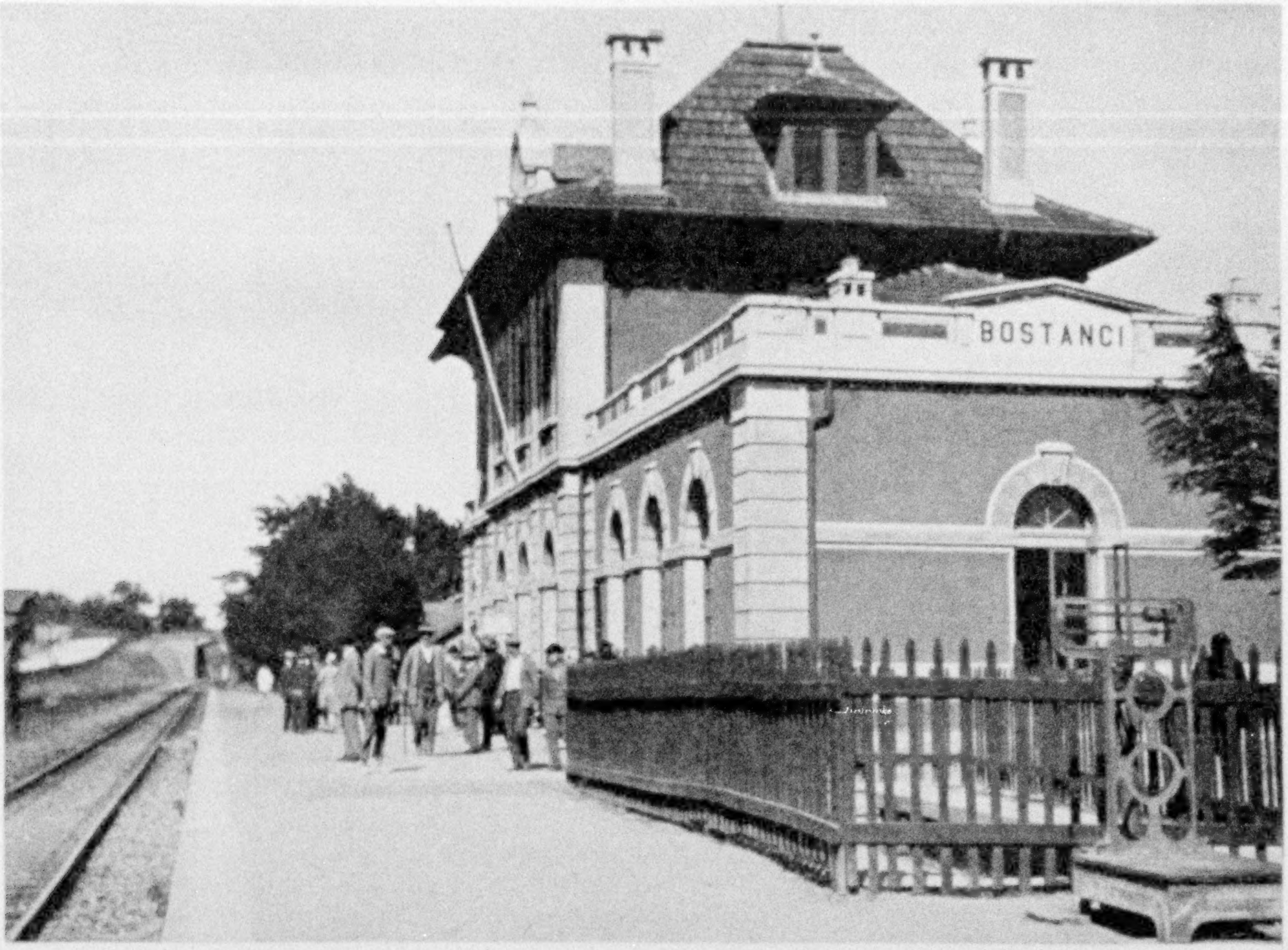
acters or be booked for dismissal. In a country where even college graduates consider a "Government job" a worthy prize, this method makes inertia seem less organic.

In the foreign-language newspapers a section on the adoption of the new characters soon became as much of a fixture as a comic strip or sporting page in the United States, only that it is "first-page stuff." In the Turkish papers and magazines columns or entire pages were printed in Latin characters weeks in advance of the official order for their use exclusively. The new alphabet was "news," not for amusement, but for study.

Advertising columns have become primers, picturing well-known objects whose Turkish names begin with the "new" letters. Window displays show the entire 29 new characters as initials for various objects chosen from stock and mounted on the same card with the initial and the full name in the new characters (see illustration, page 105).

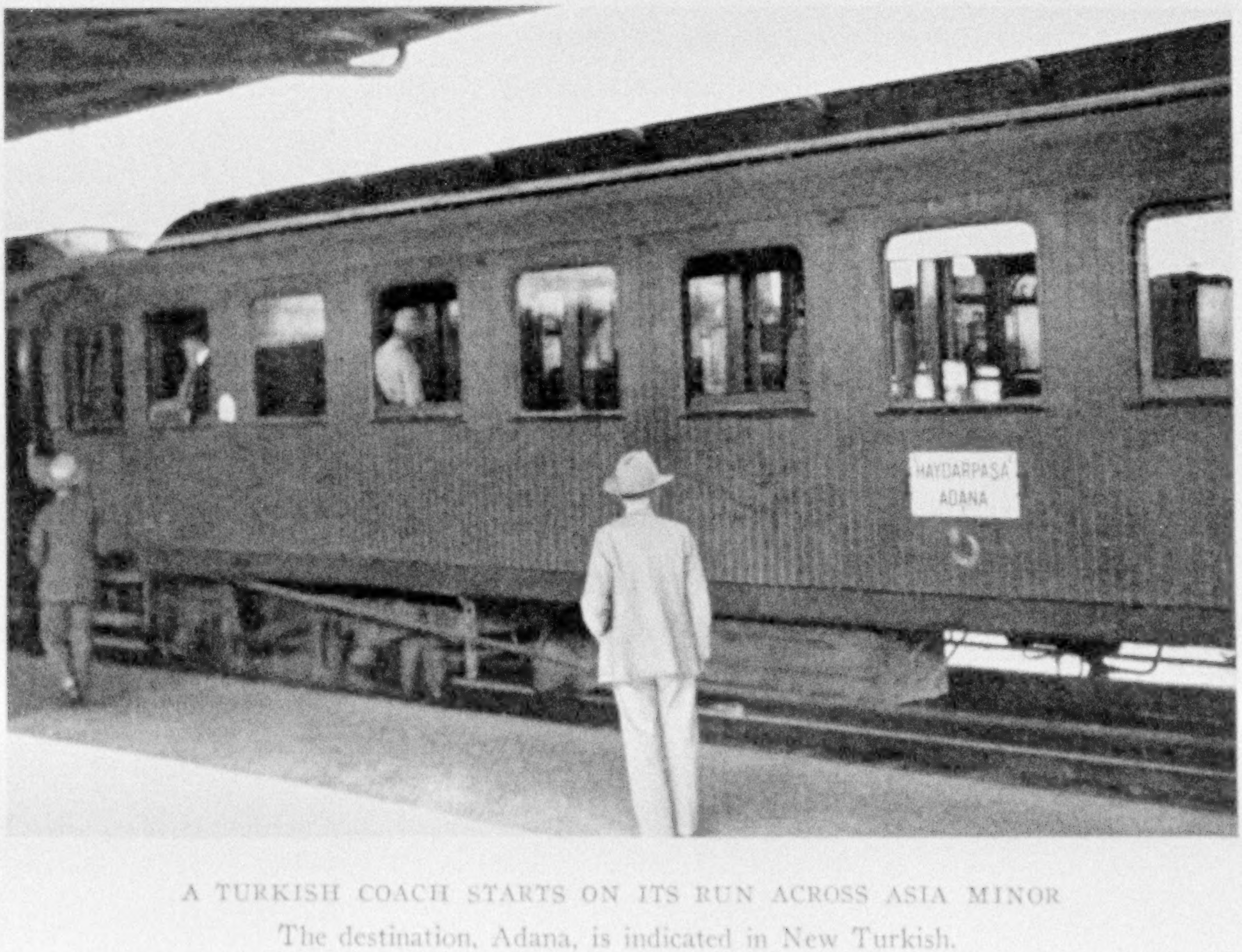
THREE FAMILIAR LETTERS ARE MISSING

On the street cars the old bilingual signs in Arabic-script Turkish and Latin-lettered French have given way to clearer signs in New Turkish, which is equally easy for the foreigner to read, even if the



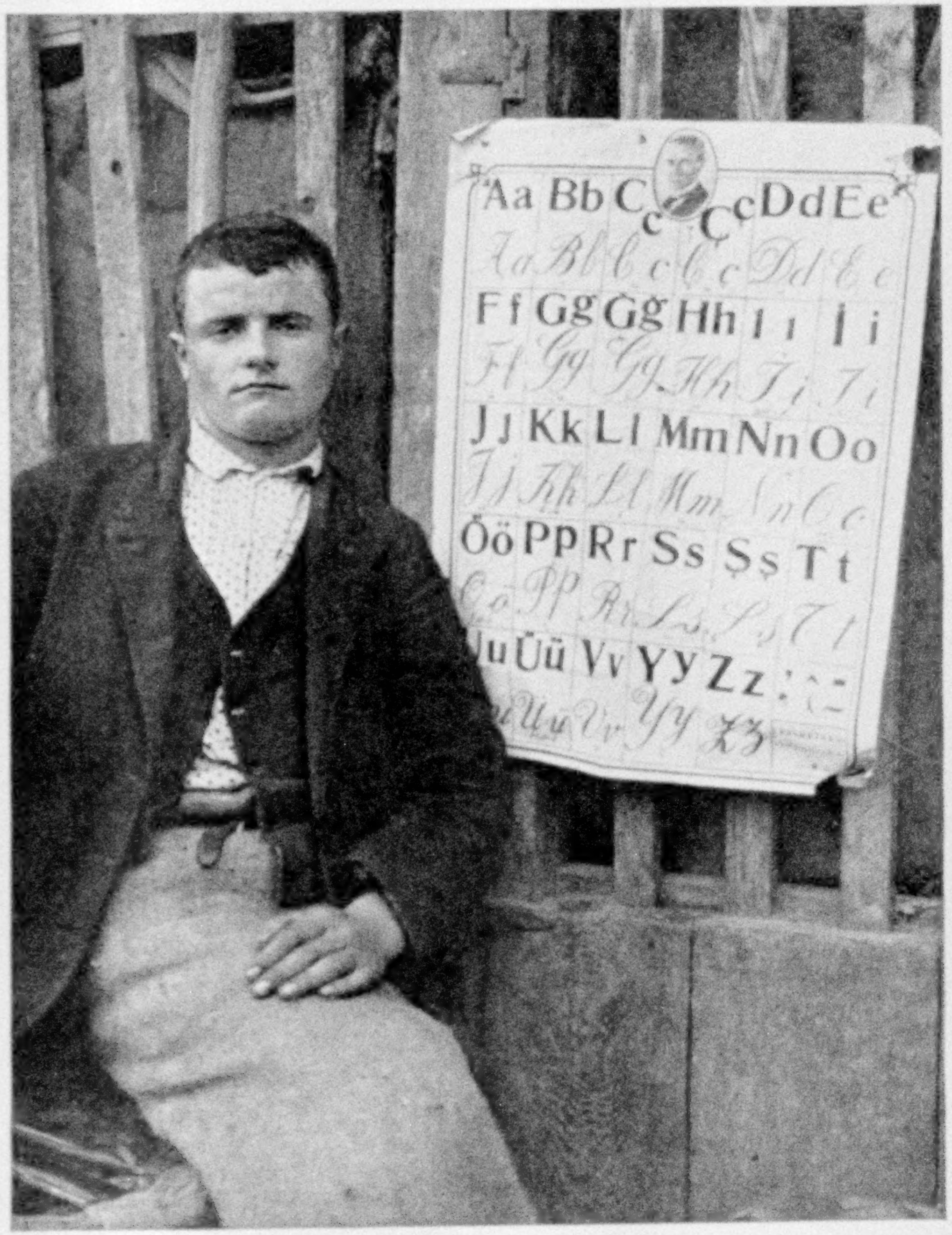
BOSTANDJI GETS ITS NAME PAINTED ON THE STATION IN NEW TURKISH

As printed, the "dj" becomes "c," which has the "g" sound in "George." This is a suburb of Constantinople.

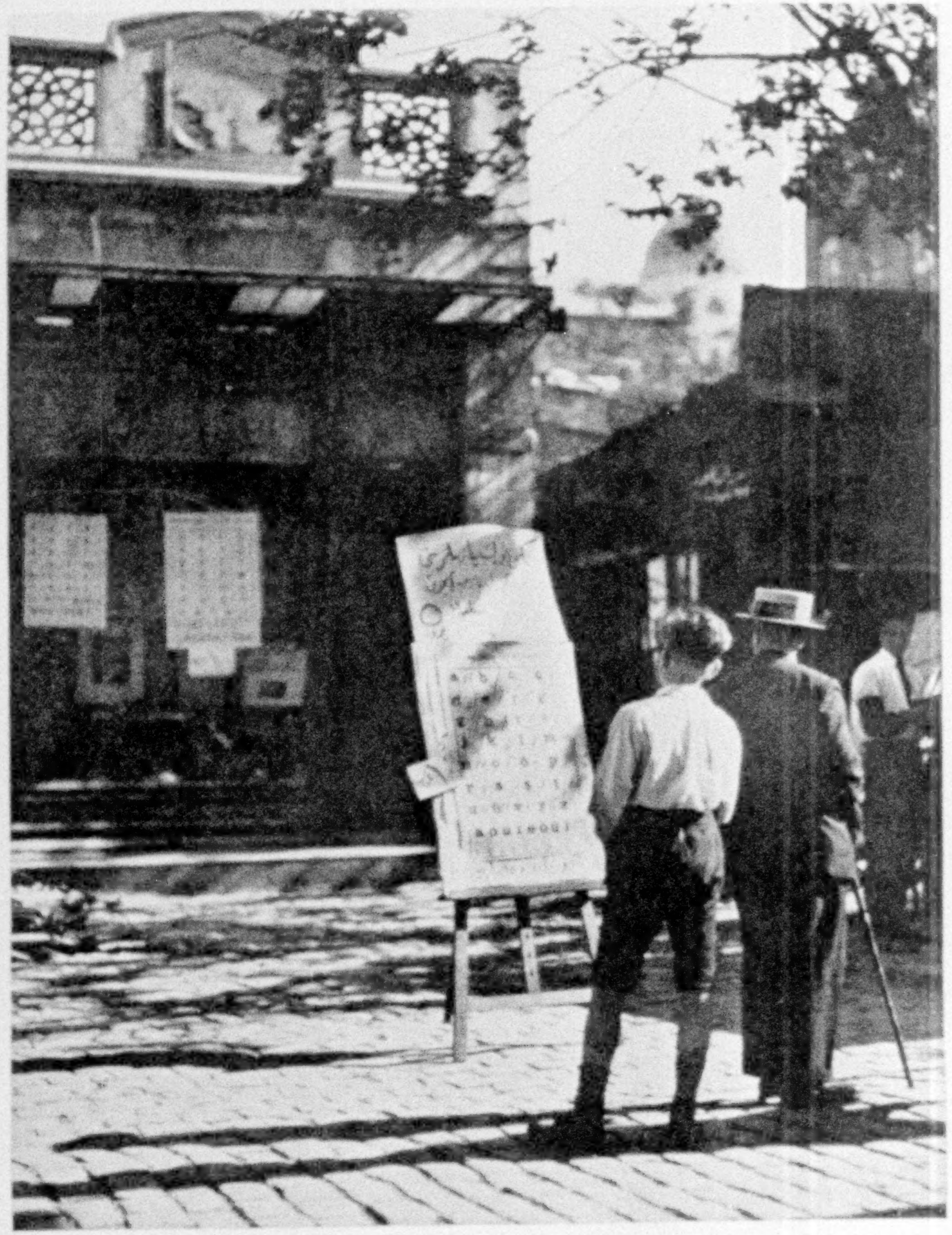


A TURKISH COACH STARTS ON ITS RUN ACROSS ASIA MINOR

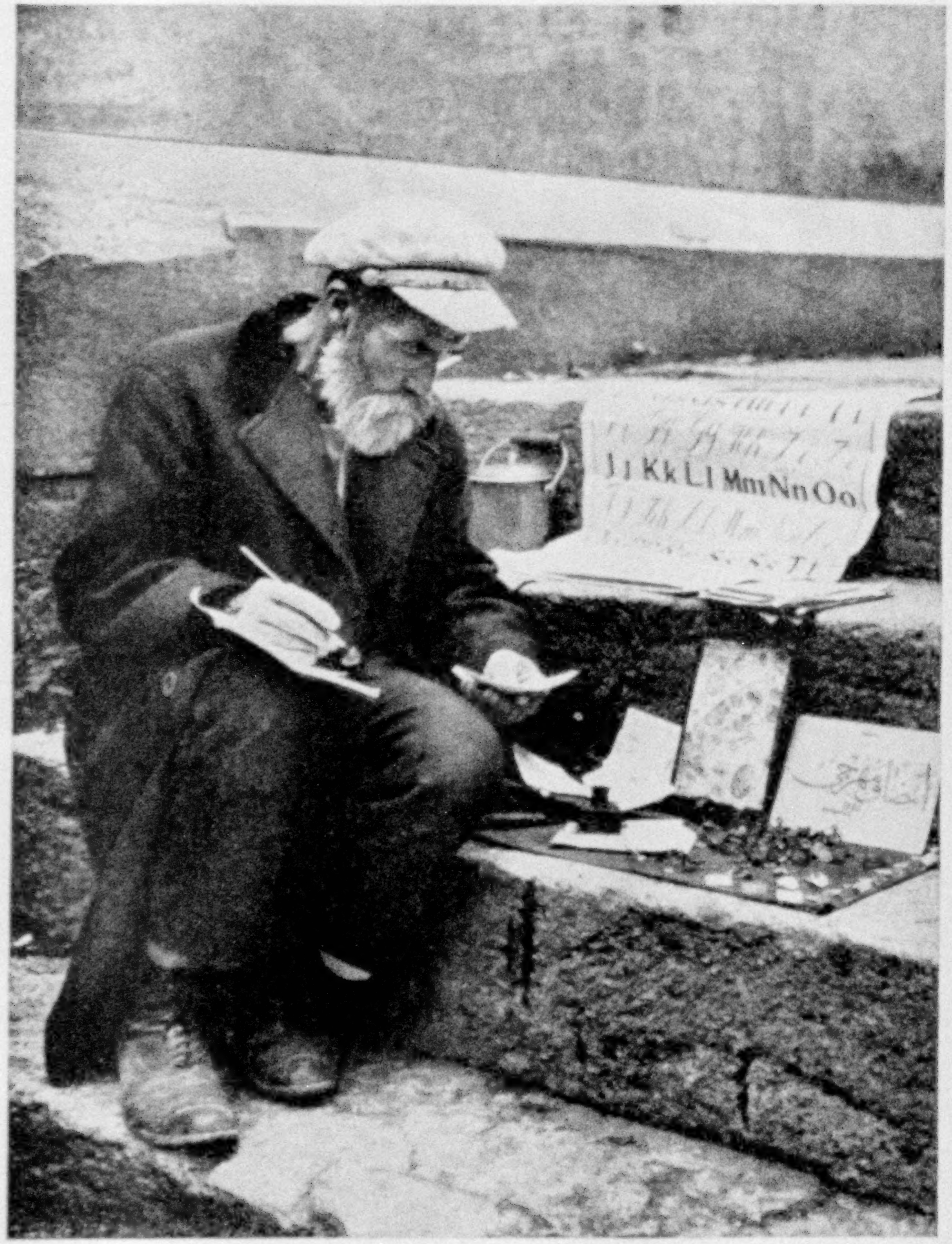
The destination, Adana, is indicated in New Turkish.


Aa Bb Cc Çç Dd Ee
Ff Gg Ğğ Hh Iı İi
Jj Kk Ll Mm Nn Oo
Öö Pp Rr Ss Şş Tt
Uu Üü Vv Yy Zz

IN LEISURE MOMENTS THIS SHOPKEEPER STUDIES HIS A-B-C'S

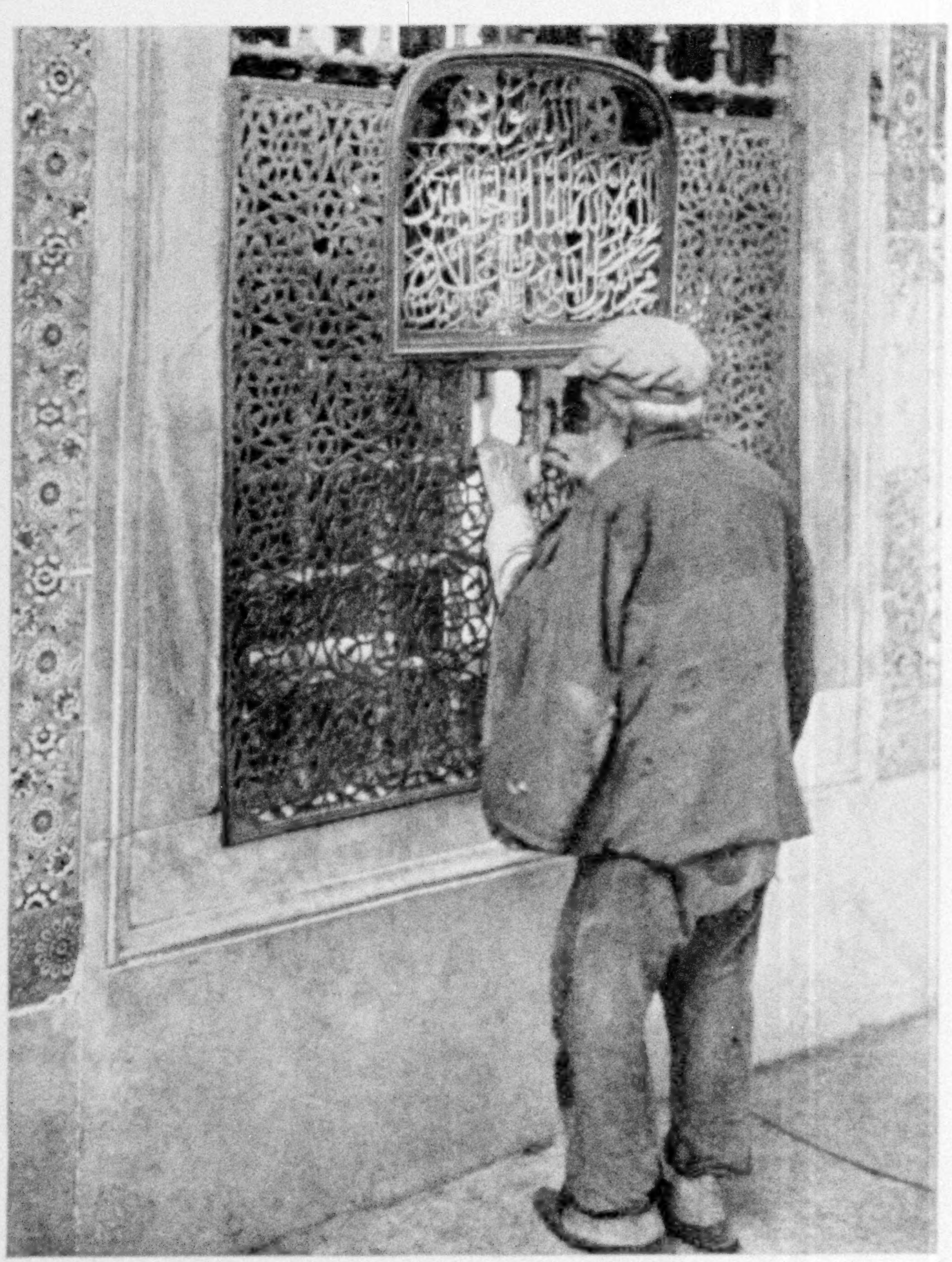


THE NEW ALPHABET DISPLAYED NEAR STAMBOUL POST OFFICE


Jj Kk Ll Mm Nn Oo

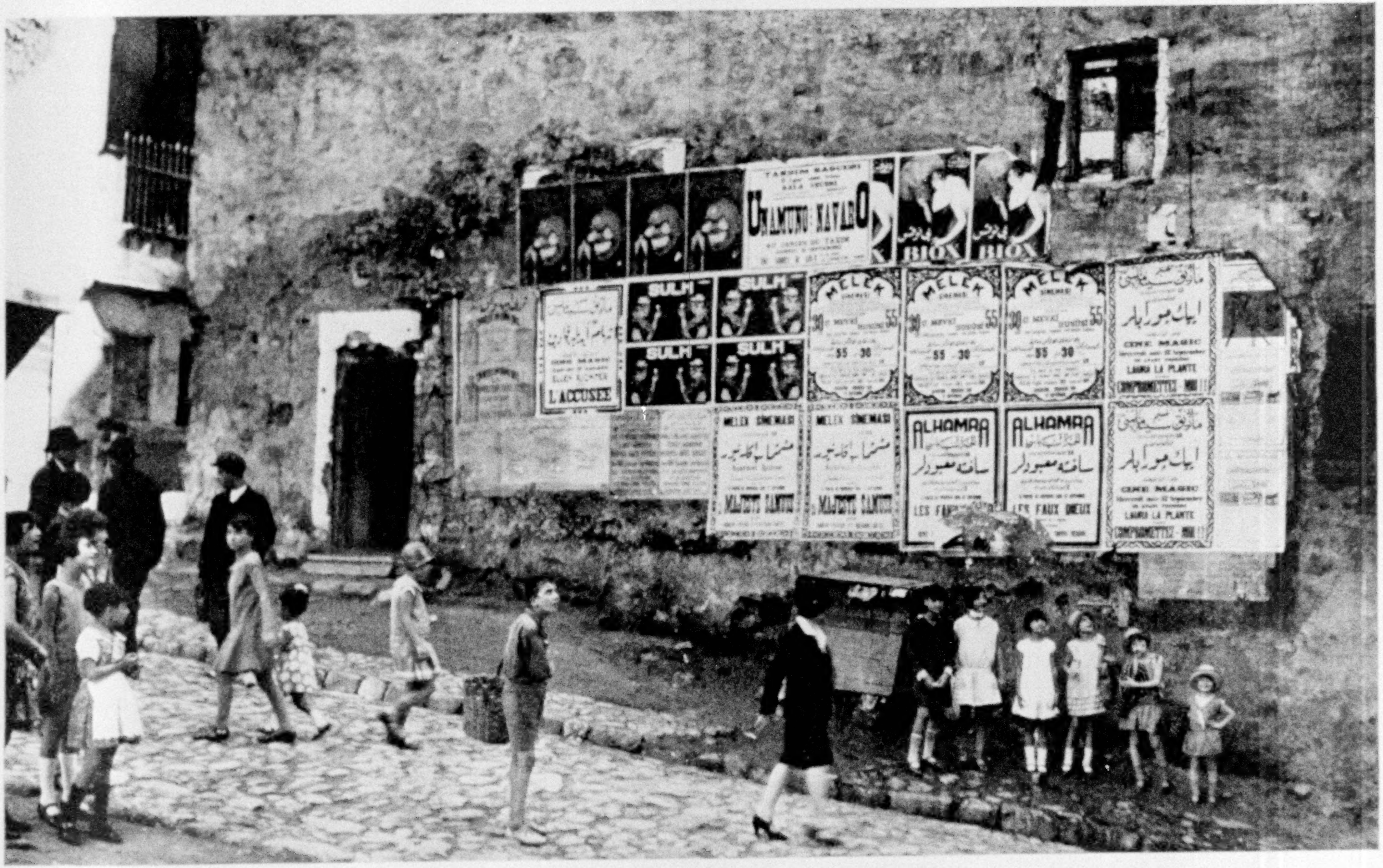
HE HAS SPENT MOST OF HIS LIFE MAKING TURKISH SEALS

At his age he now finds it necessary to learn the Latin characters of the New Turkish, and, in common with many thousands of others, is already able to write his letters. The author had him make a seal with initials in Latin characters and with Istanbul and 1928 in Arabic-script Old Turkish. Beside him are some blank seals and his engraving tools and behind him is one of the New Turkish alphabets.



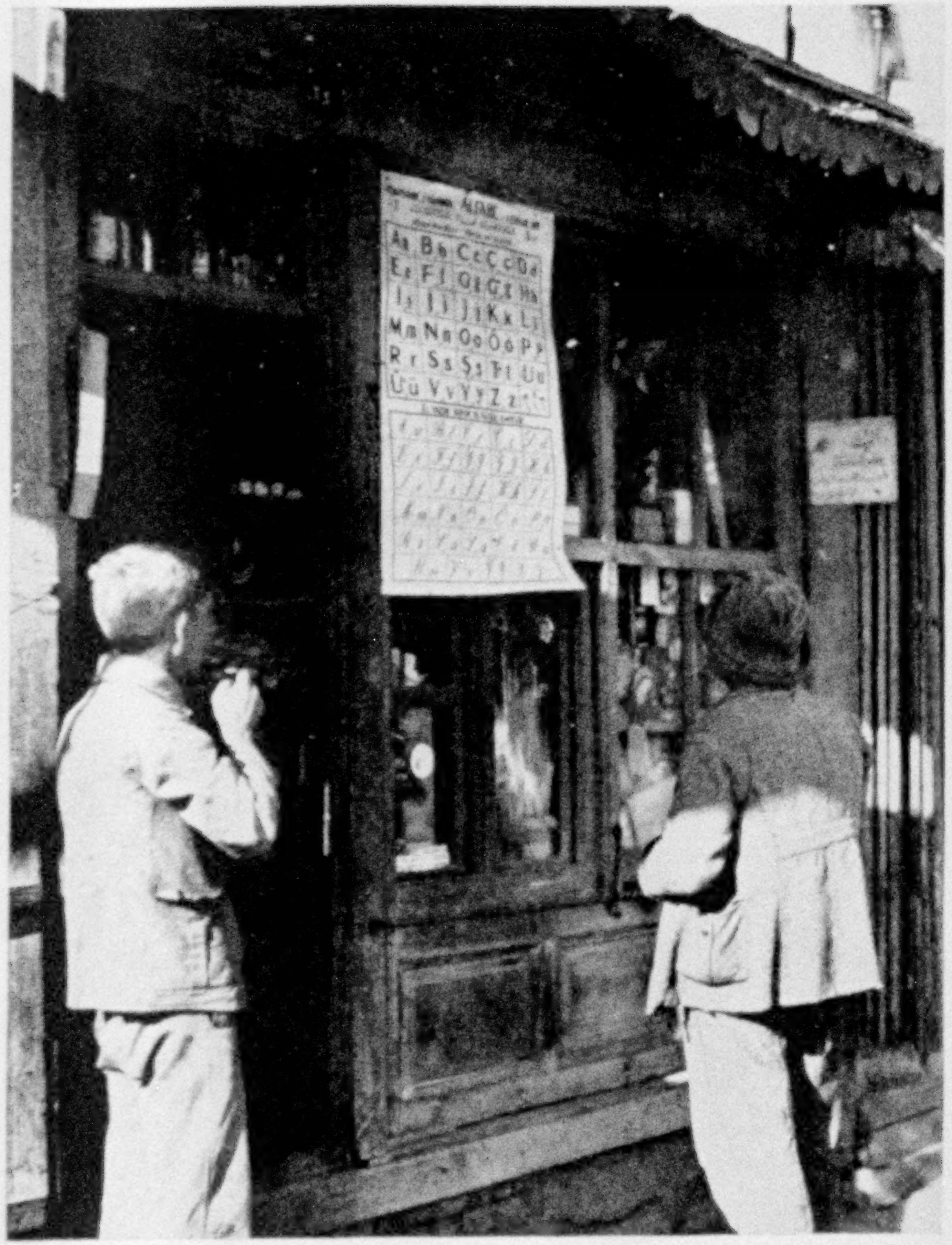
A DEVOUT MOSLEM BEFORE A WONDER-WORKING INSCRIPTION

This inscription is in the Arabic language as well as Arabic script. It proclaims the greatness and unity of God, whose prophet Mohammed was. Most visitors in standing before the inscription rub it with the palms of their hands and then rub their faces. One can see how high the polishing palms usually reach. Behind this grill is the tomb of Eyoub Ensari, standard-bearer and friend of Mohammed the Conqueror (see page 95).


SULH
MELEK
ALHAMRA
LES FAUX DIEUX
L'ACCUSEE
CINE MAGIC
LAURA LA PLANTE
MELEK SINEMASI
BIOX

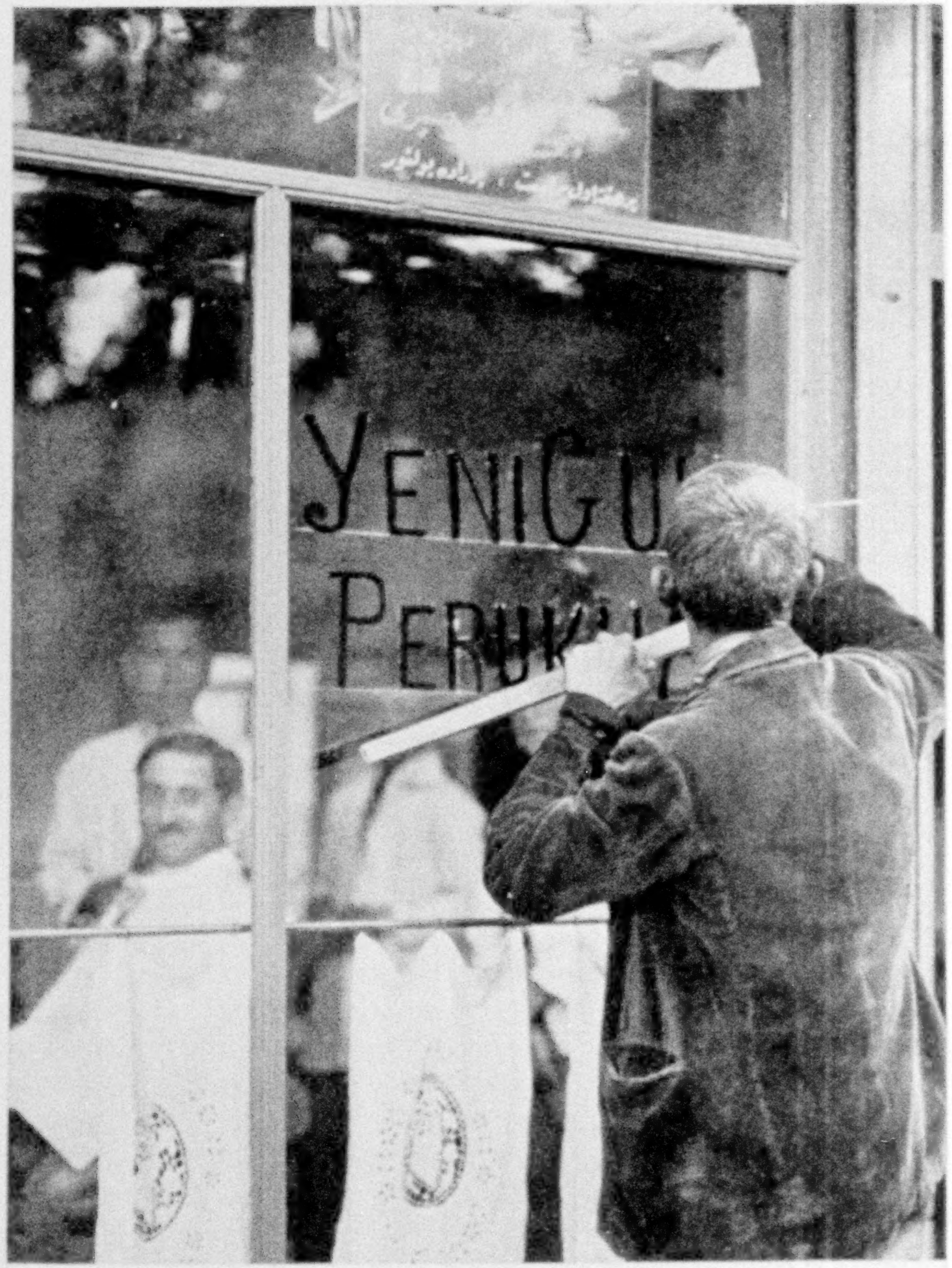
THE TRANSITION PERIOD IN THE TURKISH LANGUAGE

Moving-picture theaters announce their attractions in posters which are printed in Arabic script and in "New Turkish," as well as in French. The Alhamra (the "b" was dropped when its name was put in the new alphabet) flashes on its screen every week a humorous story in New Turkish (see text, page 107).


Aa Bb Cc Çç Dd
Ee Ff Gg Ğğ Hh
Iı İi Jj Kk Ll
Mm Nn Oo Öö Pp
Rr Ss Şş Tt Uu
Üü Vv Yy Zz

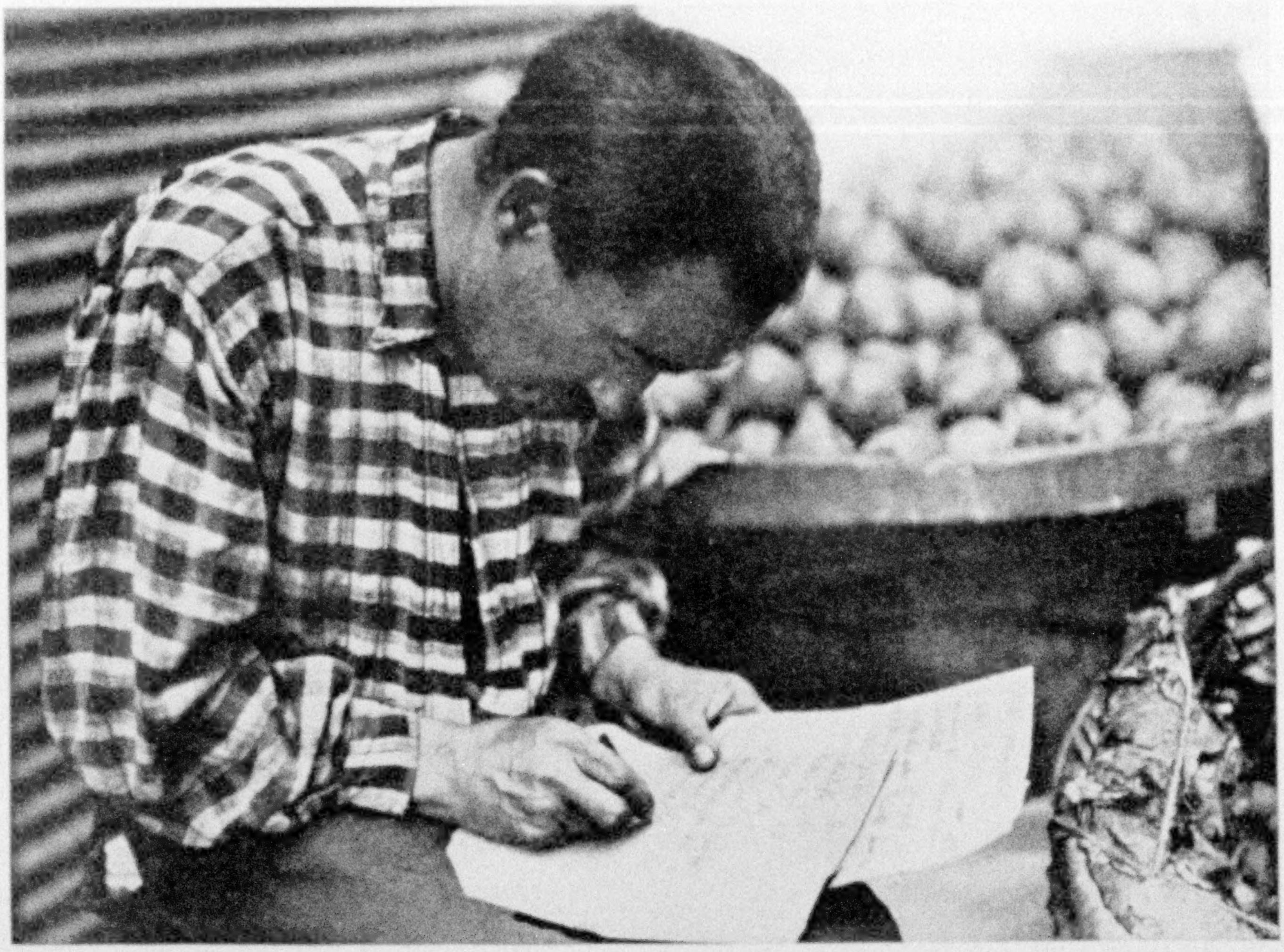
AN OUTDOOR A-B-C CLASS

The best seller in Turkey to-day is the new alphabet, but this one is not for sale. The storekeeper has turned the space in front of his shop into an impromptu classroom.


YENIGU
PERUK

A SIGN PAINTER RELETTERS A BARBER-SHOP SIGN

An advertisement in the Old Turkish writing (Arabic script) may be seen above. *Perukhari,* meaning "barber," sounds more like a wig than a shave. This is a busy time for sign painters in Constantinople.



INFORMAL CLASSES AND SELF-INSTRUCTION ARE TO BE SEEN EVERYWHERE

This man is only a seller of green groceries, yet he is toiling away on the New Turkish script and numerals. Turkey is one vast schoolroom, but the formal schools did not open last autumn until several weeks later than usual, because new texts in the Latin characters were not ready.

"d" and "t" and the "b" and "p" seem to be juggled somewhat and cedilla and umlaut markings are added.

There is no "q," no "w," no "x" in the new alphabet adopted by the Turks. The left-hand edge of the typewriter is the hardest hit. One does not go to the "Maxim" Restaurant, but to the "Maksim."

The most revolutionary change I noticed was the "BURSA," on the name plates of Broussa automobiles, and when I asked why, my informants assured me that "BURSA" came closer to the phonetics of the one-time capital than does the French form "Broussa."

TURKISH SECTION OF NEW MAP OF EUROPE MUST BE RELETTERED

Until the new dictionary appears, there will be some variations. One telegraph office proclaims itself "TELGIRAF"; another, only five minutes away, calls itself "TELGRAF." But such trifling matters may soon be righted.

Ten months ago the aid of several experts in Angora was enlisted to obtain data for the New Map of Europe being prepared by the National Geographic Society, on which each nation is to have its own place names. A partially satisfactory transliteration was the result. With the newly adopted alphabet, however, the place names of Turkey will be standardized within a few weeks.*

In the post office my registry receipts are now made out in legible New Turkish, but receipts written three months ago were unintelligible not only to me, but to my Turkish-speaking assistants.

Foreign firms in Turkey have hitherto been forced to keep their books in both

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* The entire Turkish section of the New Map of Europe, to be issued shortly as a supplement with the NATIONAL GEOGRAPHIC MAGAZINE, is being relettered in accordance with these recent changes.

SUCH POSTERS, IN ARABIC SCRIPT, ARE RAPIDLY DISAPPEARING

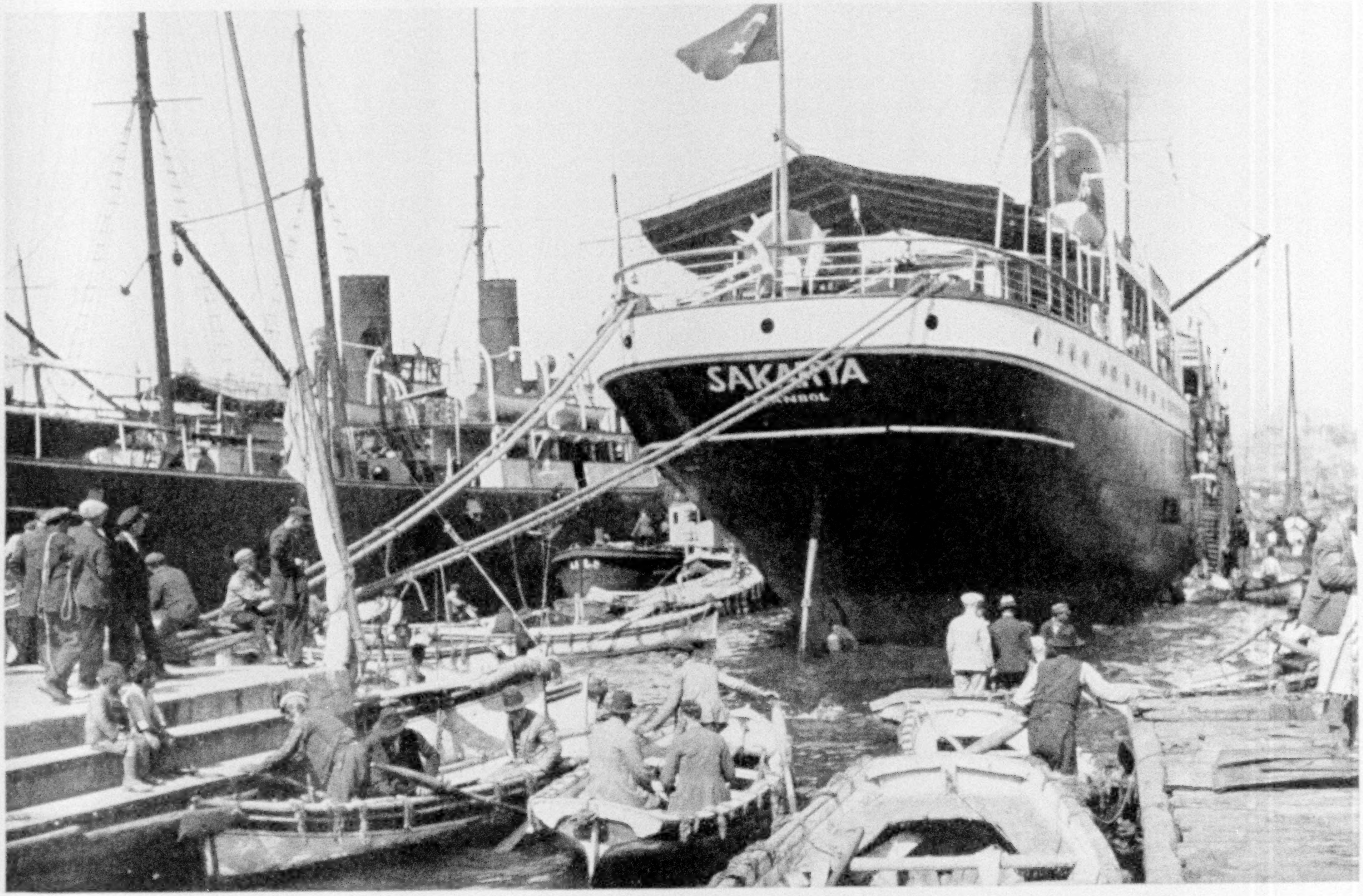
A noonday group studying a picture of the Kaaba at Mecca and various more or less choice bits of Moslem calligraphy, soon to be a thing of the past. Typewriters for typing old Turkish had as their principal feature a backspacer, which was used more than the ordinary spacer, as it required more backspacing to add the diacritical marks in the middle of words than it did spacings to separate the words themselves.

forms of numerals and in two languages. Books can soon be kept in one language, only a few Turkish trade words being necessary for the foreigner in order to make his records conform to Government requirements.

Although the change is not made with an eye to the foreigner, travel for us has become vastly simpler, and Turkey has taken on a less forbidding air, as station names in Arabic script disappear.

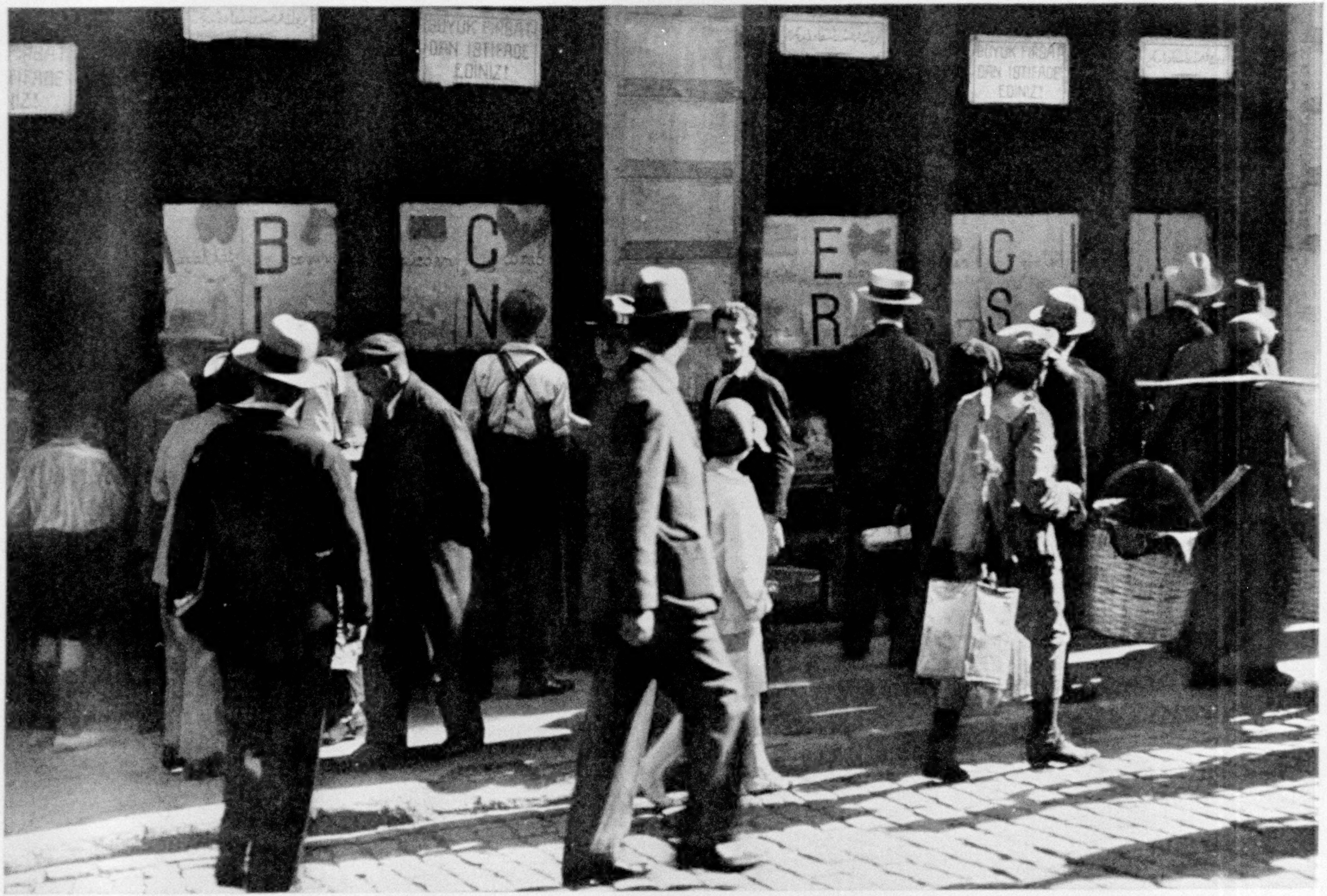
Travelers on the Orient Express or the Anatolian Railway were formerly forced to judge their position by consulting a watch or a sextant. They can now read the station signs. On the sides of the Turkish cars, as well as on the International sleeping cars, the names of the termini are marked so plainly that even he who runs to his train may read and catch the right one (see illustration, page 97).

To the foreigner some of the changes seem to have been made wrong end to. The name on his steamer has been painted in Latin characters, and the number on the funnel is the un-Arabic "Arabic" numeral, to which the West is accustomed. But the time-table and the list of stops made by that particular boat are still in the old characters. Meanwhile the correspondence



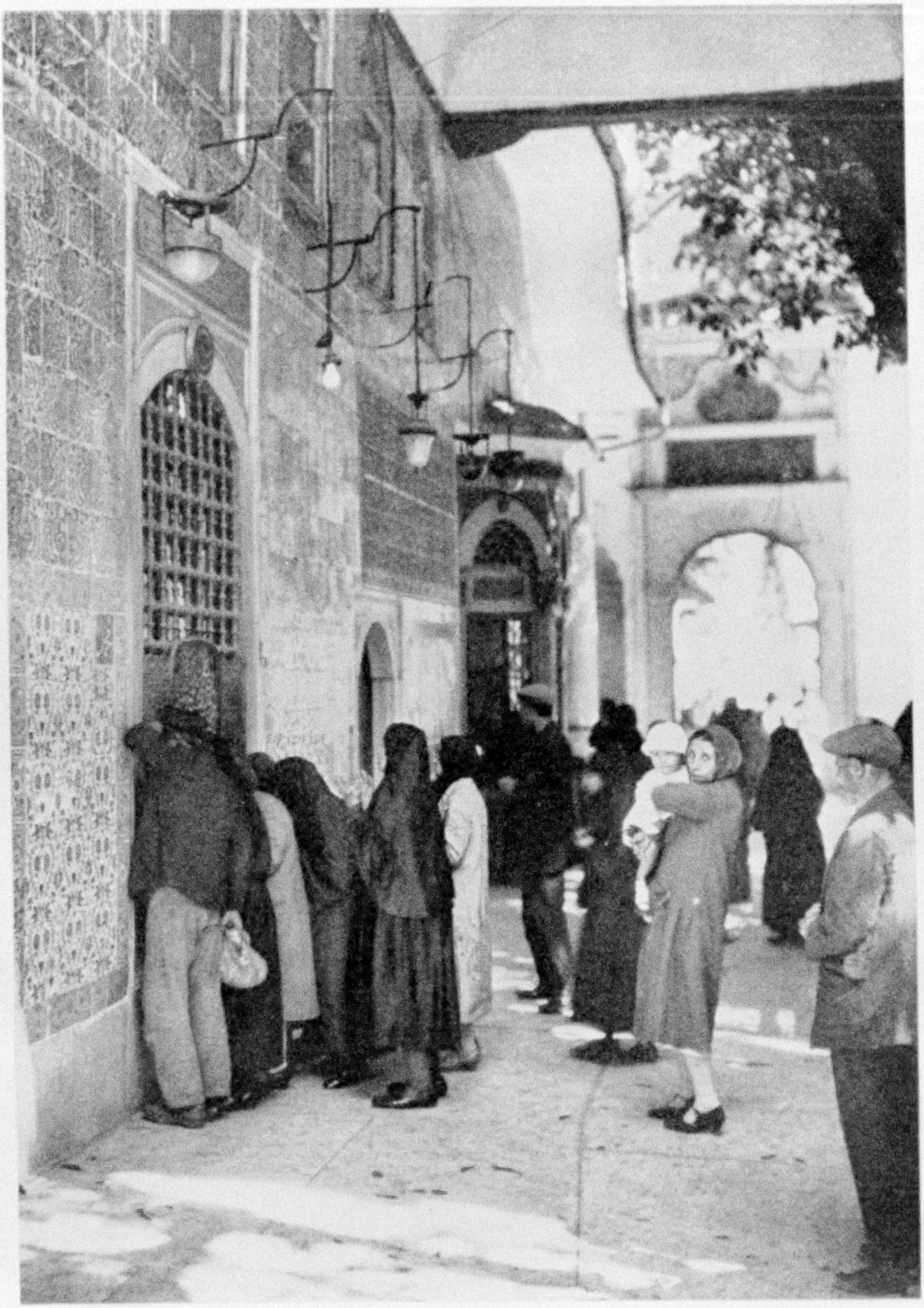
A CONSTANTINOPLE WHARF SCENE WITH THE NAME OF THE "SAKARYA" IN LATIN CHARACTERS

On this steamer the name of the city is spelled "Istanbol," although the accepted spelling a few piers away is "Istanbul." Such discrepancies are not unusual.


BÜYÜK FIRSAT DAN ISTIFADE EDINIZ!
BÜYÜK FIRSAT DAN ISTIFADE EDINIZ!
B
C
E
G
N
R
S

A DEPARTMENT STORE PUTS ON A PRIMER CLASS IN ITS SHOW WINDOWS

Each of the new A-B-C's is used as the initial for some familiar object chosen from stock (see, also, text, page 96). There are 29 letters in the New Turkish alphabet, as follows: a, b, c, ç, d, e, f, g, ğ, h, ı (without a dot), i, j, k, l, m, n, o, ö, p, r, s, ş, t, u, ü, v, y, and z. One of the "i's" is dotted, both as a capital and as a small letter. The other is not dotted, either as a small letter or as a capital. The Turkish lacks our q, w, and x. Several signs in the Old Turkish characters hang above.



DEVOUT TURKS OFFERING THEIR FRIDAY PRAYERS BEFORE THE HANDSOME TOMB OF EYOUB ENSARI

Mohammed the Conqueror built the Eyoub Mosque in honor of his color bearer, who fell during the capture of Constantinople (see, also, illustration, page 99).

of the shipping company is being done in the new characters, and the Turks are only awaiting the arrival of typewriters with the newly adopted Latinized keyboard before business correspondence will become legible, if not understandable, to all.

PROGRESSIVE FOREIGN FIRMS WERE CAUGHT NAPPING

One striking feature of the revolutionary change in alphabet was the way it caught the foreign firms napping, so that they now lag rather than lead. Sewing machines, automobiles, oil and gasoline, breakfast foods, and cleansers still retain the Arabic script in their advertising and on their products. An "ESSEKS" advertisement is the only one of its kind that I have so far noted.

Although one moving-picture theater half-heartedly uses Arabic script for its titles and every week flashes a funny story in the new alphabet on its screen, thus starting such a course in concerted title reading as "movie" fans have always had to endure, the cinemas have largely adopted the new alphabet (see page 100).

The "interior," as Anatolia is called by the Constantinopolitans, is outspeeding the former capital, and Stamboul seems to be more affected than Pera (the European quarter), where bilingual signs in old Turkish and French, English, German, or Russian were common.

The blackboard and copy book have become major equipment in post office, police station, store, and bank. But the classroom is wider than that. Miles out from Broussa, while waiting for the Cape Town-Stockholm Motor Expedition, I was asked to read an entire column printed in the new alphabet and was assured that what I read made sense, though not to me. Cafés, ferries, and street cars are all improvised classrooms of this nation at school.

An American moving-picture man, with a flair for the dramatic, found a group of turbaned Moslems studying Latin characters on tombstones in the English cemetery.

PROFESSIONAL SCRIBES ARE ASSISTING BACKWARD GOVERNMENT OFFICIALS

In the porch of Yeni Djami the professional scribes have mastered the new script and are ready to save backward bureaucrats from downfall. Near at hand, but facing starvation, are the seal engravers, whose involved inscriptions, like a banker's signature, are models of studied illegibility, but who will find it hard to make even a monogram as attractive in the new characters (see illustration, page 99).

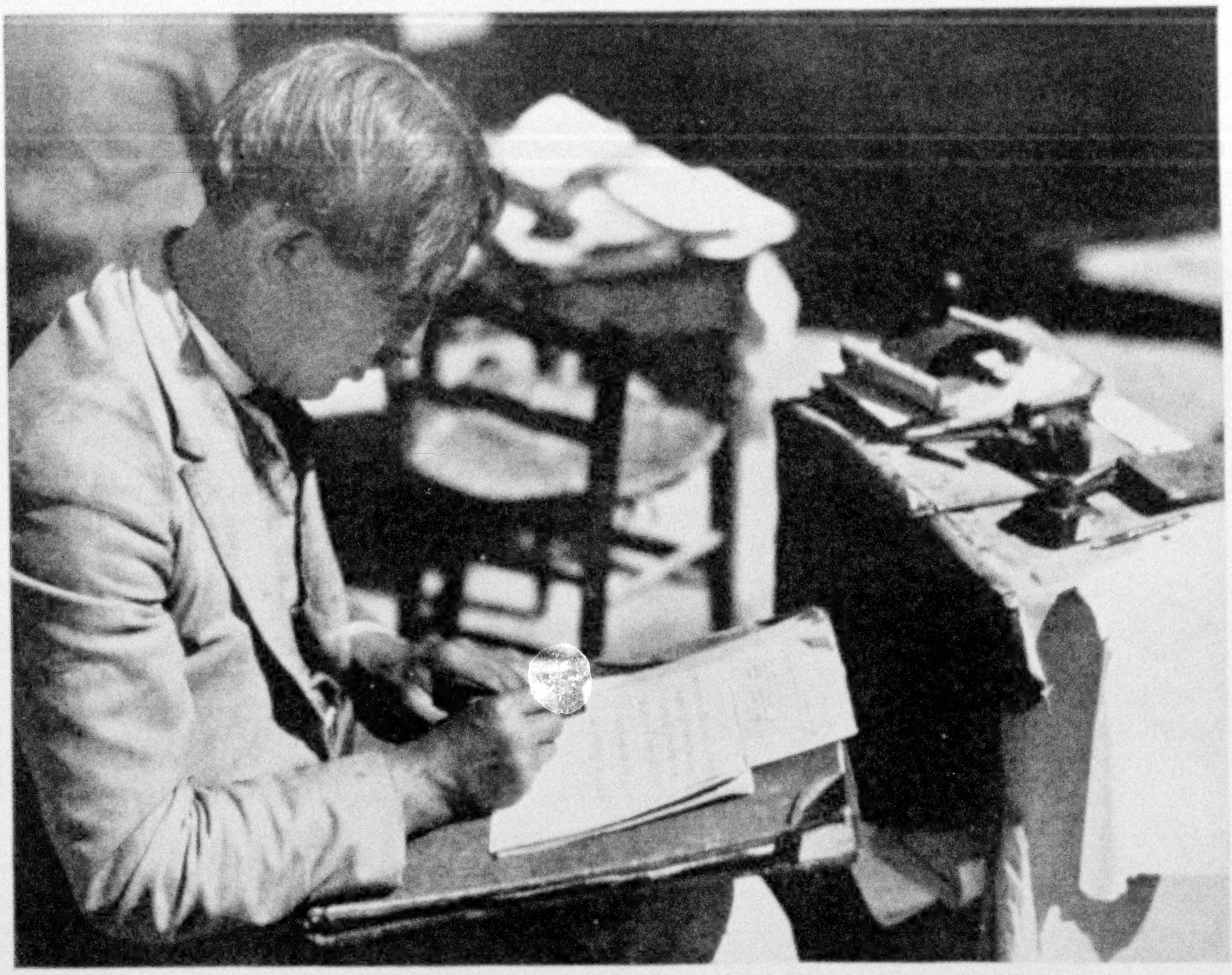
What the effect on Moslem art will be none can say. There are rumors that the great decorative inscriptions by Tekhedj Zade Ibrahim and others will be changed, which is a little like making over a Raphael or a Michelangelo on a typewriter. Many of the mosque inscriptions are in the Arabic language as well as Arabic script, and hence have no direct relation to the present problem.

Iconoclastic enthusiasm for the wonder-working "New Turkish," which is to awaken a nation from illiteracy and backwardness, may even touch some Arabic inscriptions whose beauty in a house of worship has seldom been equaled and never surpassed. But if one fears that, he can go out to Stamboul's Sistine Chapel—the one-time Church of St. Saviour, now the Kahrieh Mosque—and see Christian mosaics and frescoes in an edifice rebuilt by Justinian. As Moslems come to prayer they cross a vestibule on whose ceiling the miracles of Christ are still pictured, although human figures on wall brackets have been destroyed by iconoclasts.

As yet there is no indication that this movement toward enlightenment through a more easily understood alphabet will result in the destruction of art treasures whose fame is worldwide. If the splendid calligraphy which so dominates Moslem art from ceramics to architecture now ceases, existing treasures may be valued more than ever.

ABANDONED FEZZES, VEILS FOR WOMEN, AND OLD ALPHABET INDICATE TURKEY'S CHANGING VIEWPOINT

New Turkey is definitely stepping away from other lands where the Arabic script still prevails, just as she did when she abolished the fez and tried to free women from the veil. But this may prove a link rather than a breach. Persia and Afghanistan are already following the superficial changes which Turkey recently adopted. Second-hand Prince Alberts may find as wide a market as did second-hand hats and



A PUBLIC SCRIBE PRACTICING THE LATIN SCRIPT

These professional letter writers are much in demand among Turkish Government officials who have not yet mastered the intricacies of the "new" alphabet, but whose positions depend upon the adoption of the innovation.

caps when the fez was removed. Safety razors are pushing their conquests farther east on a wave of Turkish nationalism.

Only a few years ago Turkey was nominated as an American mandate. She is now eagerly adopting changes which no foreign tutor would dare impose, and is winning a cultural leadership far beyond the Ottoman boundaries.

That an eastern land is now modernizing and westernizing the Near East at a pace such as no Western nation or nations ever set is just one of those paradoxes in which history delights. Suffering from no oppression psychosis, the Turks freely accept what no outsider could impose.

With the adoption of the New Turkish alphabet, a nation is going to day school and night school. Having withdrawn his capital into the heart of Anatolia, the Turk has not only retreated from the intrigues and indignities of the past, but has carried Western modernism—for better or for worse—into regions little touched by Occidental culture.

Yet, in making his fight for the New Turkish alphabet, the President of Turkey invaded the foreign-language, foreign-press, foreign-thinking city of the Sultans. The tool he uses is not the sword, but the pen—that and the stub of a pencil that the grizzled mail messenger grips in his cramped fingers, as he sits on the lower deck on a Bosporus "chirket" and painfully learns to write a script which will take a letter to any country in the world.

INDEX FOR JULY-DECEMBER, 1928, VOLUME READY

Index for Volume LIV (July-December, 1928) of the National Geographic Magazine will be mailed to members upon request.

MAPPING THE HOME OF THE GREAT BROWN BEAR

Adventures of the National Geographic Society's Pavlof Volcano Expedition to Alaska

By Dr. Thomas A. Jaggar

Director of the Expedition

With Illustrations from Photographs by R. H. Stewart, Staff Photographer of the National Geographic Society

NEAR the end of the Alaska Peninsula, in the region roundabout Pavlof Volcano, a National Geographic Society expedition in the summer of 1928 explored and mapped 2,500 square miles of territory.

It is in this part of North America that the great brown bears of Alaska (*Ursus gyas* and a cousin, *Ursus middendorffi*) make their home, and here, in the course of The Society's scientific studies of volcanic activities, the members of the expedition encountered many of these enormous creatures, not only the largest of all bears, but the largest living carnivorous animals, sometimes attaining a weight of 1,500 pounds.

It was the great brown bear and his wild-life associates — caribou, red foxes, and hair seals — which provided variety and zest during our months of labor among gale-swept, fog-bound cliffs and mountains of our far northwestern territory.

Supplementing its map work and its technical researches in volcanology, the latter being in line with the investigations of The Society's five previous expeditions to Alaska in the Mount Katmai volcanic region,* the 1928 party collected more than a thousand specimens of the flowering plants of beach, tundra, and hillside, which blossom profusely during June, July, and August. Rocks, minerals, and fossils were also collected, and more than 500 photographs were made by the staff photographer.

Following a reconnaissance in 1927, the National Geographic Society authorized our last summer's expedition, with the author as geologist and director; C. P. McKinley, of the U. S. Geological Survey, as topographer; R. H. Stewart, of The Society's staff, as photographer; John Gardner and Peter A. Yatchmeneff as fieldmen, and a cook.

AMPHIBIAN CRAFT USED AS BOAT, AUTOMOBILE, AND SLEEPING CABIN

One of the novel features of the expedition's equipment was an amphibian "mobile-boat" designed especially for the territory in which the exploring party was to work.

This craft was the outcome of experiments made during the previous year's reconnaissance work by the director. A small cross-country automobile with low gears and balloon tires, which had been operated successfully along stony beaches and had penetrated grassy flats and tundra, seemed only to lack a boat body to enable it to round headlands.

The 1928 steel amphibian was 21 feet long and was equipped with a Ford engine, twin screws, a worm truck drive, and double rear tires. The inclosed body had water-tight compartments both fore and aft (see pages 126 and 127).

This odd-looking vehicle weighs 3,700 pounds. Its radiator sits on top of the cabin, and a cooling pipe for the circulating water incloses the boat below the water line. A power winch and a heaving bar for hauling or levering the craft out of soft ground and an outboard motor are features of its emergency equipment.

The craft was christened *Honukai* (Hawaiian for Sea Turtle). It was used throughout the summer and was utilized as a sleeping cabin for the director when

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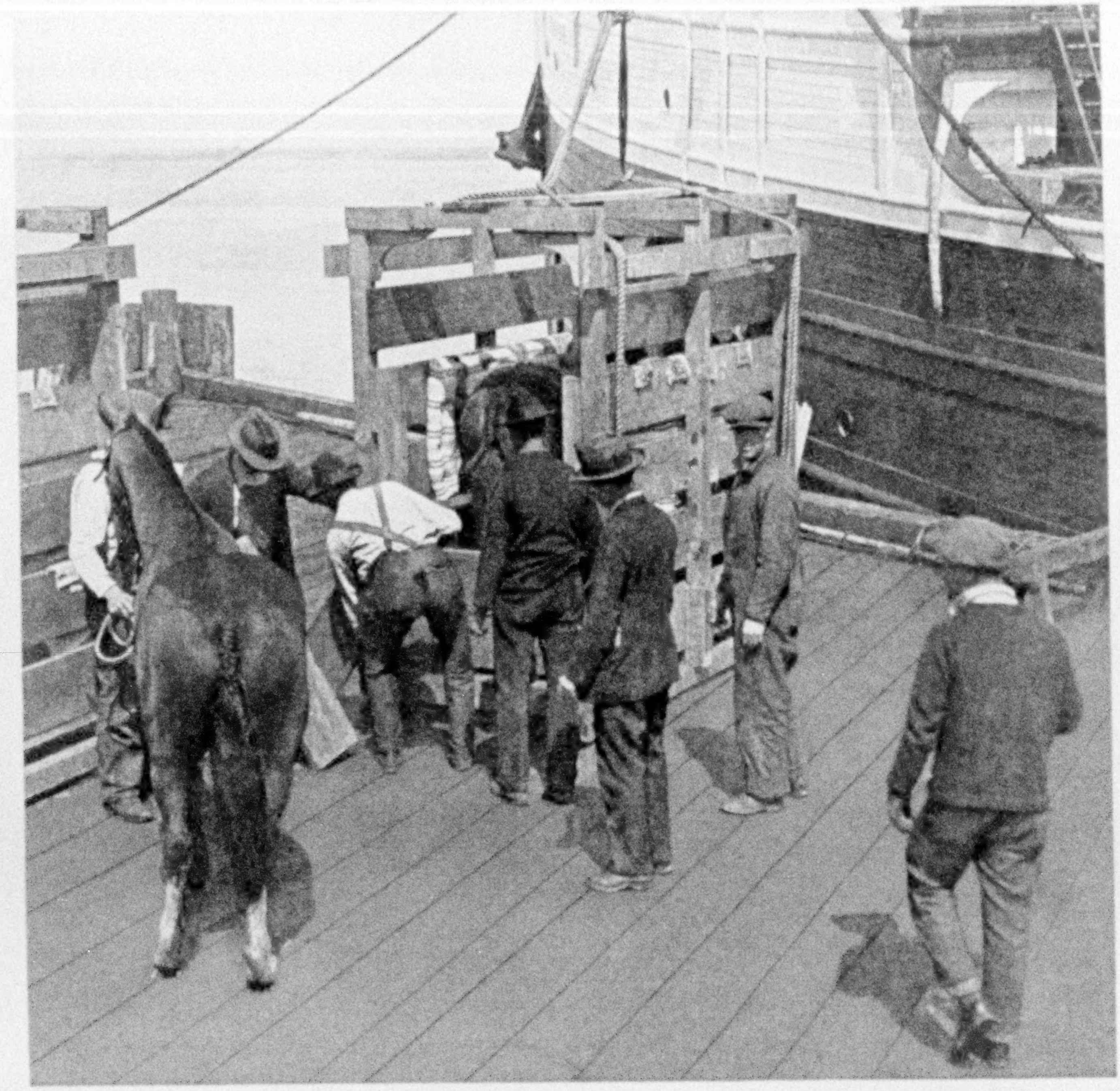
* See, also, in the National Geographic Magazine, "The Valley of Ten Thousand Smokes," January, 1917, and February, 1918, and "Our Greatest National Monument," September, 1921, by Robert F. Griggs.



THE HORSES OBJECTED TO OCEAN TRAVEL

Teddy and Midget were great pets, but they did not take kindly to being led into the mattress-padded crate stalls provided for their transportation. On the dock at Bellingham, Washington, they put up lively resistance before they were placed aboard ship.

run on the beach and into grassy flats, taking its place beside the A-tents which sheltered the other members of the party. As it could run ashore in a surf, it needed no harbor, and it was frequently used to carry freight between the *Geographic*, our regulation gasoline troll boat, and the shore (see pages 114 and 124).

In the course of the summer's work the *Honukai* made several short trips inland over hard tundra and grassy flats and one long beach trek when camp was being moved. It was used repeatedly in transporting baggage for distances of 15 to 30 miles by water, sometimes operating under its own power, but usually its propellers were assisted by a towline attached to the *Geographic*.

As we knew that there would be no service stations within many hundred miles of that portion of the Alaska Peninsula where we were to conduct our explorations the *Honukai* underwent drastic tests in Puget Sound at the hands of its designer, Mr. George E. Powell, prior to the departure of the expedition from Bellingham, Washington, in April.

EXPEDITION LANDS AT SQUAW HARBOR

The expedition was put ashore at Squaw Harbor, Baralof Bay, on the eastern side of Unga Island (see map, page 112), and

SWINGING OVER THE SIDE

The first animal to go aboard neighed frantically and tried to escape from his stall. He was mollified, however, when Midget in her crate was set down beside him. Both animals proved their mettle during the summer's work (see text, page 123).

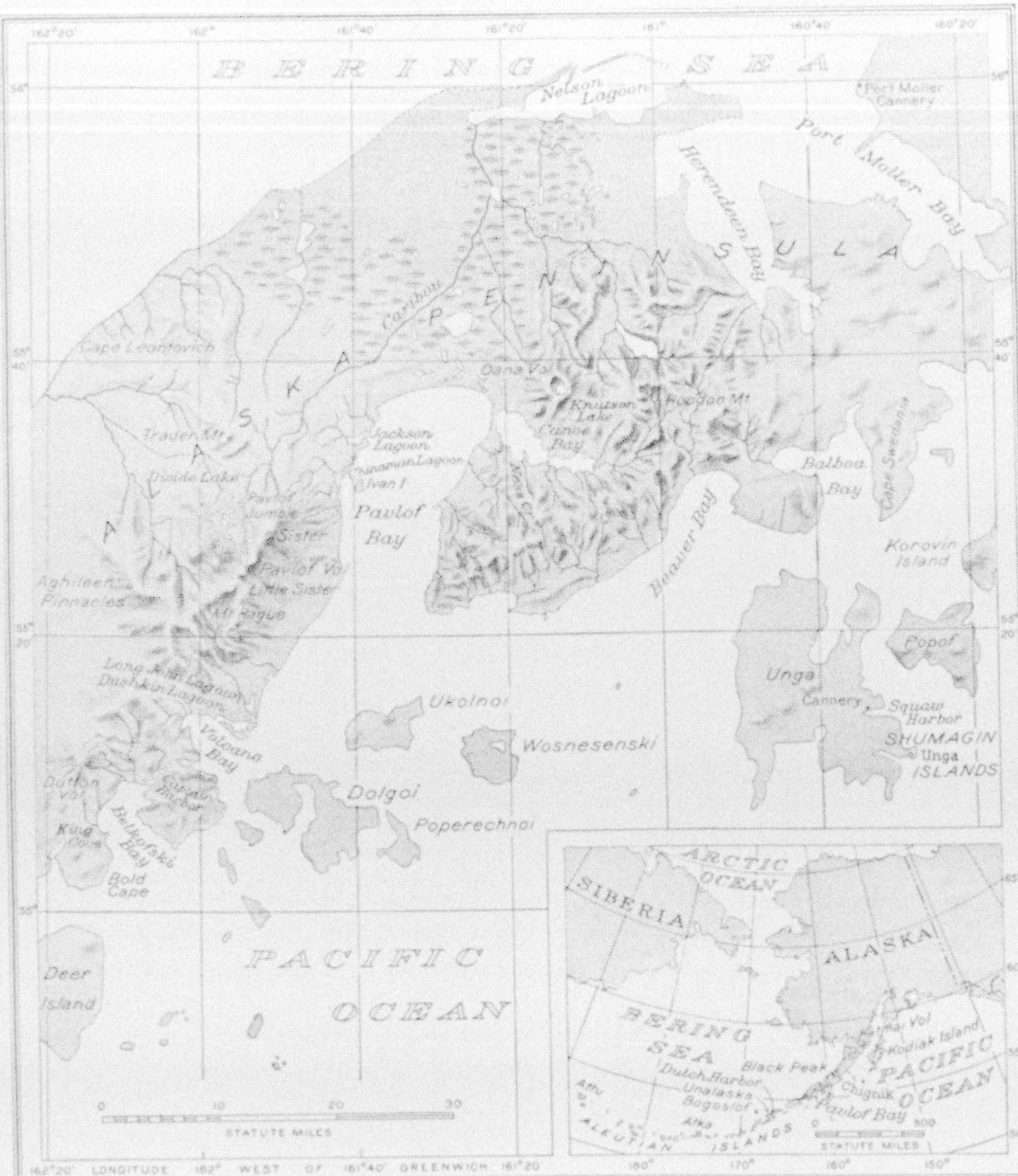
it was to the northwest of this starting point that the summer's work was to be done.

The old small-scale Russian charts of the interior and northern shore of this part of the Alaska Peninsula in which The Society's expedition worked were the only ones extant. They were found to be quite erroneous in many particulars. On Bering Sea certain indentations designated as Garfield Bay and Gerstle Bay do not exist, and a long glacier shown extending west from Pavlof Volcano is in reality a great valley composed chiefly of clinker lavas. On these old charts big mountains are shown west of Herendeen Bay in a region which is actually a sloping lowland. Instead of the six lakes, previously shown south of Nelson Lagoon, there is a vast level area containing 500 lakes and ponds.

Some maps show an "Otter Bay" extending northwest from the head of Beaver Bay. In reality this "bay" is a valley. These are a few of the errors which have been erased from the earth's map by five months' intensive fieldwork.

CANOE BAY CAMP, A WONDERFUL SITE

From our preliminary camp on Squaw Harbor the *Warrior*, with a scow in tow, was loaned by a cannery to transport us 75 miles to Canoe Bay, an eastern arm of


BERING SEA
Nelson Lagoon
Port Moller Cannery
Port Moller Bay
Herendeen Bay
ALASKA PENINSULA
Caribou
Cape Leontovich
Dana Vol
Knutson Lake
Canoe Bay
Pogoao Mt
Balboa Bay
Cape Swedania
Trader Mt
Divide Lake
Jackson Lagoon
Chinaman Lagoon
Ivan I
Pavlof Bay
Pavlof Jumble
Sister
Pavlof Vol
Little Sister
Aghileen Pinnacles
Mt Hague
Beaver Bay
Korovin Island
Popof
Unga
Cannery
Squaw Harbor
SHUMAGIN ISLANDS
Unga
Long John Lagoon
Dushkin Lagoon
Ukolnoi
Wosnesenski
Volcano Bay
Dutton Vol
Cold Harbor
Dolgoi
Poperechnoi
King Cove
Belkofski Bay
Bold Cape
Deer Island
PACIFIC OCEAN
STATUTE MILES
0
10
20
30
162°20' LONGITUDE 162° WEST OF 161°40' GREENWICH 161°20'
160°40'
160°20'
161°
56°
55° 40'
55° 20'
55°
ARCTIC OCEAN
SIBERIA
ALASKA
BERING SEA
Katmai Vol
Kodiak Island
Black Peak
Chignik
Dutch Harbor
Unalaska
Bogoslof
Atka
Attu
Pavlof Bay
ALEUTIAN ISLANDS
PACIFIC OCEAN
STATUTE MILES
0
500
180°
170°
160°
150°
65°
60°
55°
50°

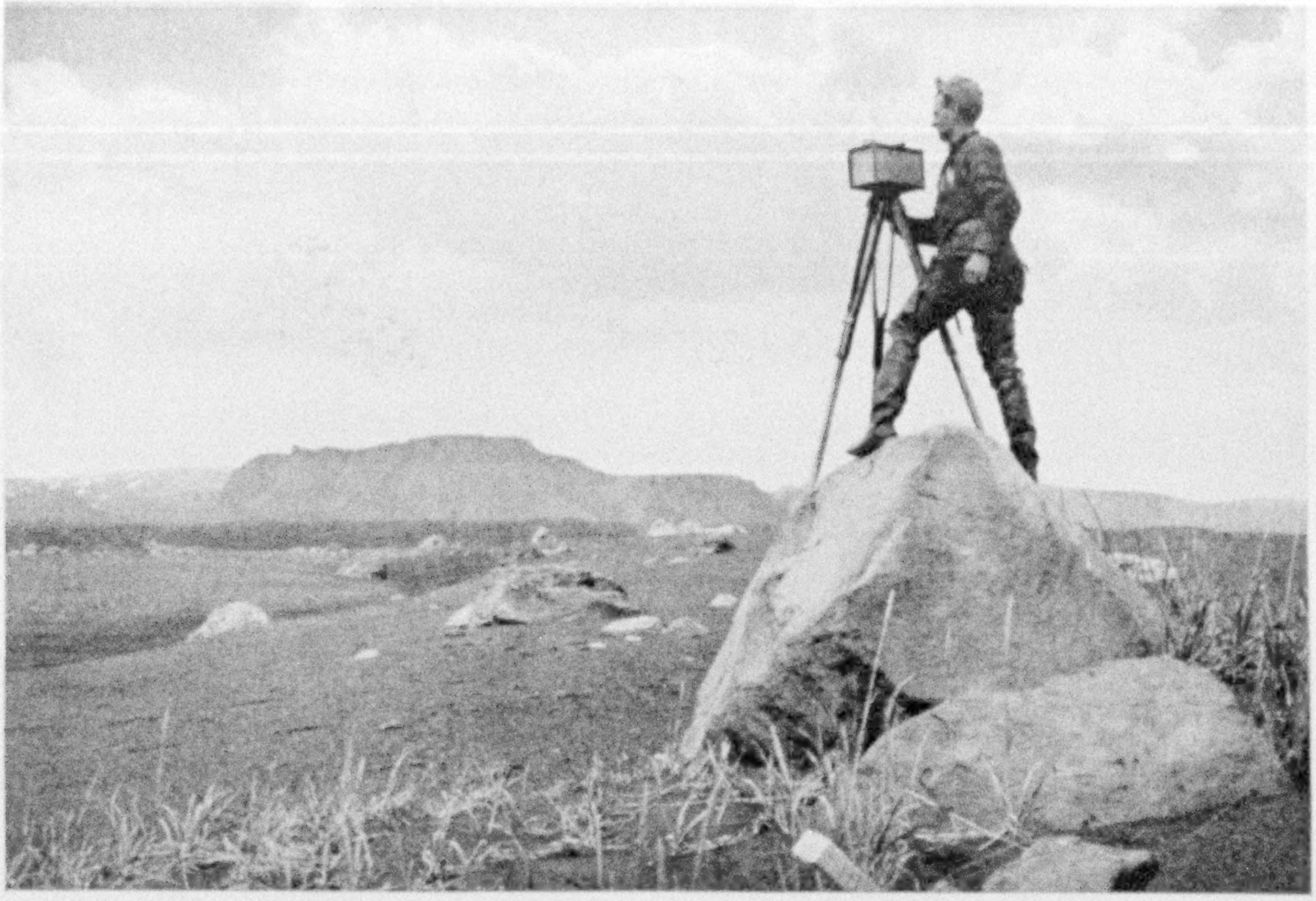
Drawn by A. H. Bumstead

THE PAVLOF EXPEDITION OF 1928 MAPPED 2,500 SQUARE MILES OF TERRITORY

The only charts in existence prior to this map, which is based on data compiled by the National Geographic Society party of last summer, show an entirely different northern shoreline and hinterland for a portion of the western end of the Alaska Peninsula. The geologist-director of the expedition conducted his chief scientific studies in the region surrounding the Pavlof group of volcanoes.

Pavlof Bay. Our journey began at 3 o'clock one morning, and it was nearing the following midnight when the amphibian boat was taken from the deck of the scow and the two horses of our expedition's equipment were led down the gangplank to the beach.

Canoe Bay is a glorious place. To the north is a snowy volcano with its cup crater in full view, with rugged encircling outliers and sweeping slopes leading down to the water's edge, covered with dark purple tundra. I have suggested for this volcano the name Dana in honor of



NOTHING FOR MILES BUT LAVA, BLACK ASHES, AND BOWLDERS

From the top of a rock marked with a plate of the Coast and Geodetic Survey, McKinley operated his topographic camera. The only vegetation to be seen was a narrow belt of alder brush. This area at Black Point, near the mouth of Pavlof Bay, was the most desolate part of the country explored.

America's noted geologist and student of volcanoes. It is 4,300 feet high, about the same size as Vesuvius and Mont Pelée.

To the east of Canoe Bay there are scarped mountains. A river meanders through a fine valley and enters the head of the bay (see pages 124 and 127).

To the south there are other rounded mountains, where in slate we found fossil leaves of oak and poplar and evergreens. These indicate that where now there are only alder and willow, mosses, grass and flowers, a forest once covered this part of the world. There are also marine shell fossils in some of the strata (page 120).

Canoe Bay is a landlocked body of water ten miles long, with a narrow tidal channel, or pass, at its western end. It is surrounded by fine beaches.

A VARIETY OF ANIMALS AND BIRDS

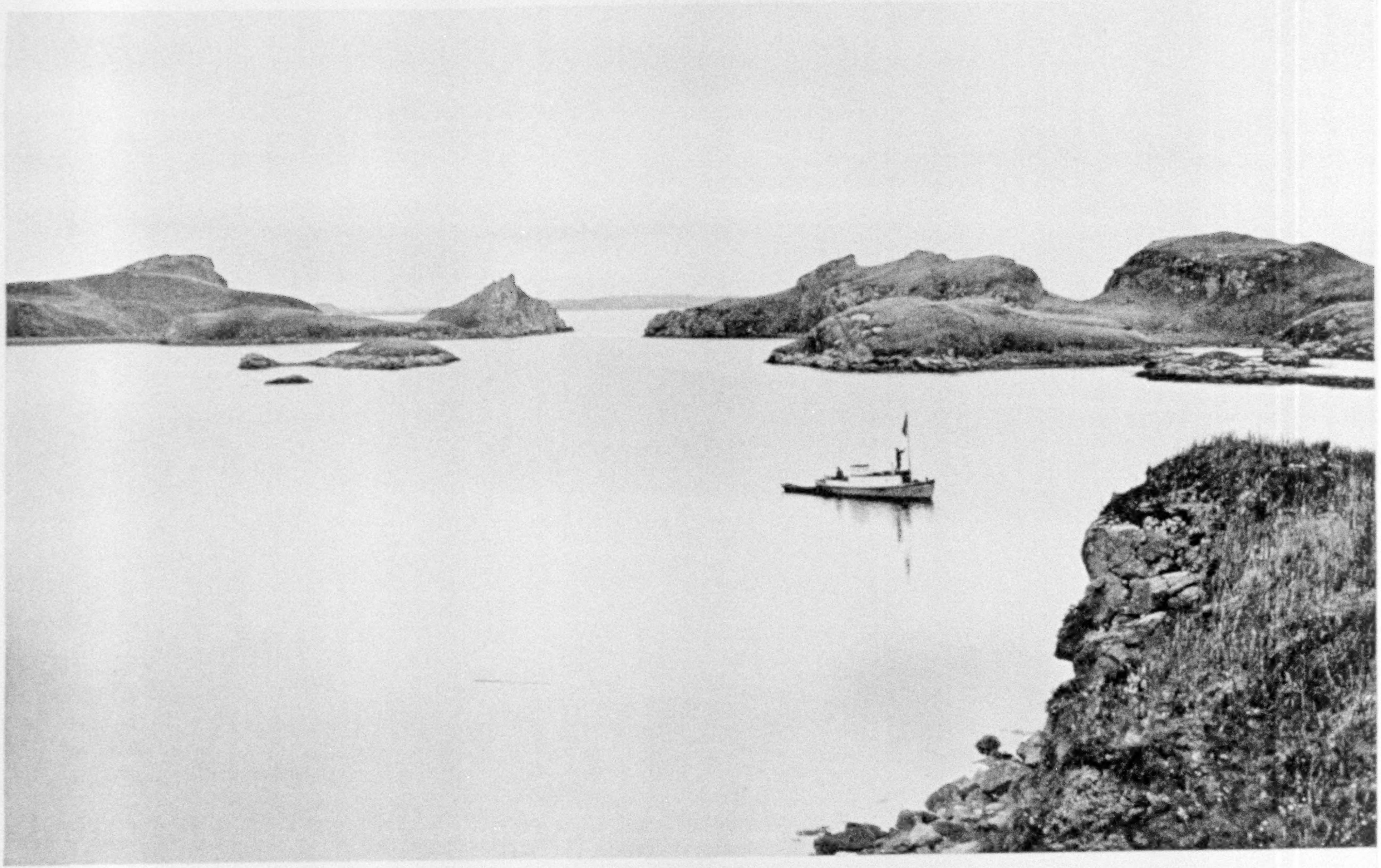
Our camp, at a cove protected by three islets, had fine clamming flats spread before it when the tide receded, and on the islets we could gather scores of big, olive-drab gull eggs flecked with brown. Hard boiled, these are good, scarcely distinguishable from hen eggs in flavor, and entirely without any fishy taste.

Caribou, hair seals, and bears were abundant. We had not been in camp an hour before we saw the tracks of red fox, caribou, and the famous big brown bear.

The caribou, in small groups of from two to nine, were first encountered to the south and east of Canoe Bay.

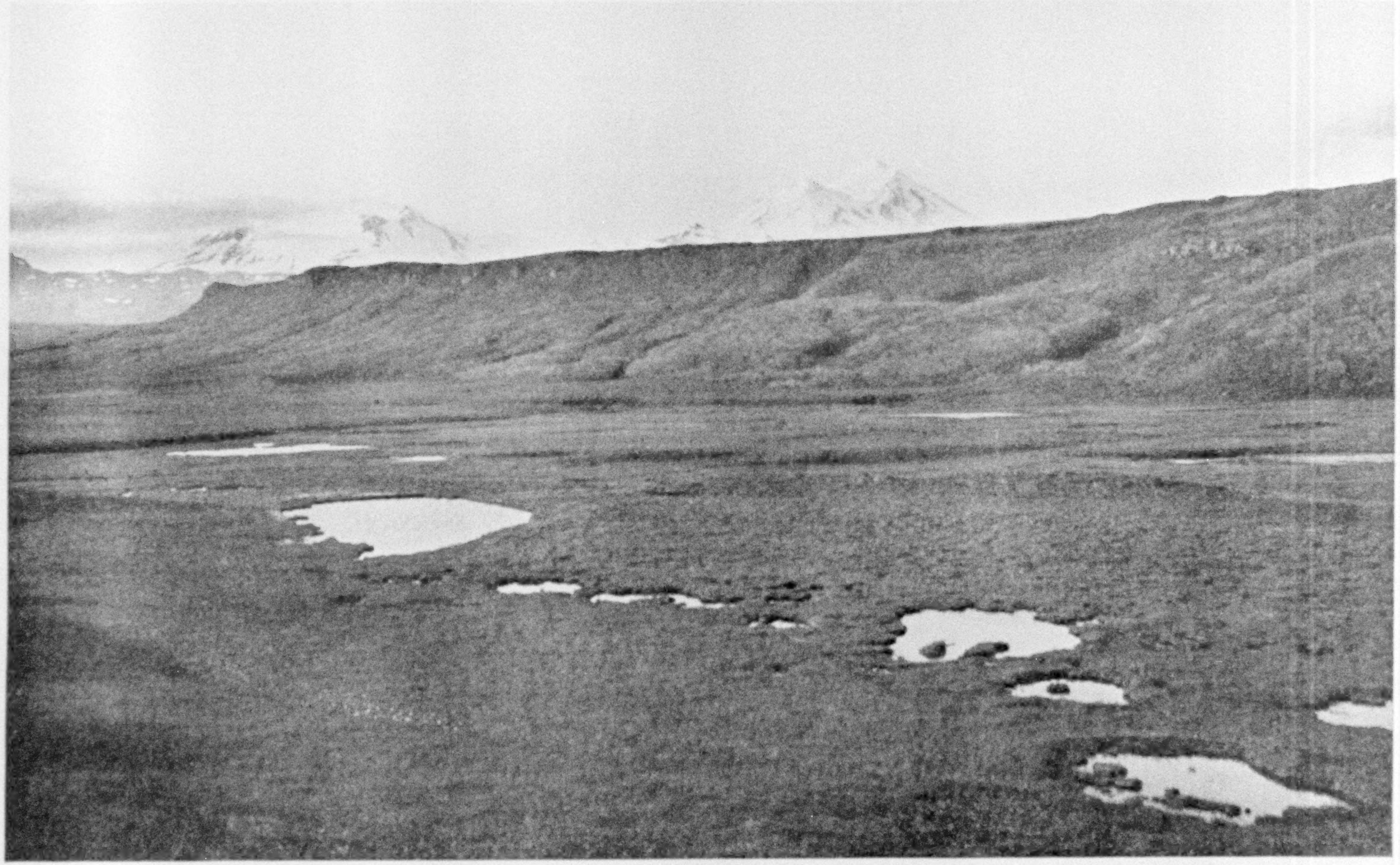
At some islets near the inner narrows was a colony of hair seals. These interesting creatures splashed about our boats with great unconcern and some became very tame. One little fellow had been domesticated, so to speak, by some salmon-trap watchmen, who kept him unconfined in a box by a brook. He would make a childlike moaning sound when hungry, and if trout were to be had he was fastidious and would refuse to eat salmon. The watchmen would get out poles and catch tiny trout for him in the creek, take them off the hook, toss them to him, and the live fish would go wiggling down his throat.

Then one of the men would carry him



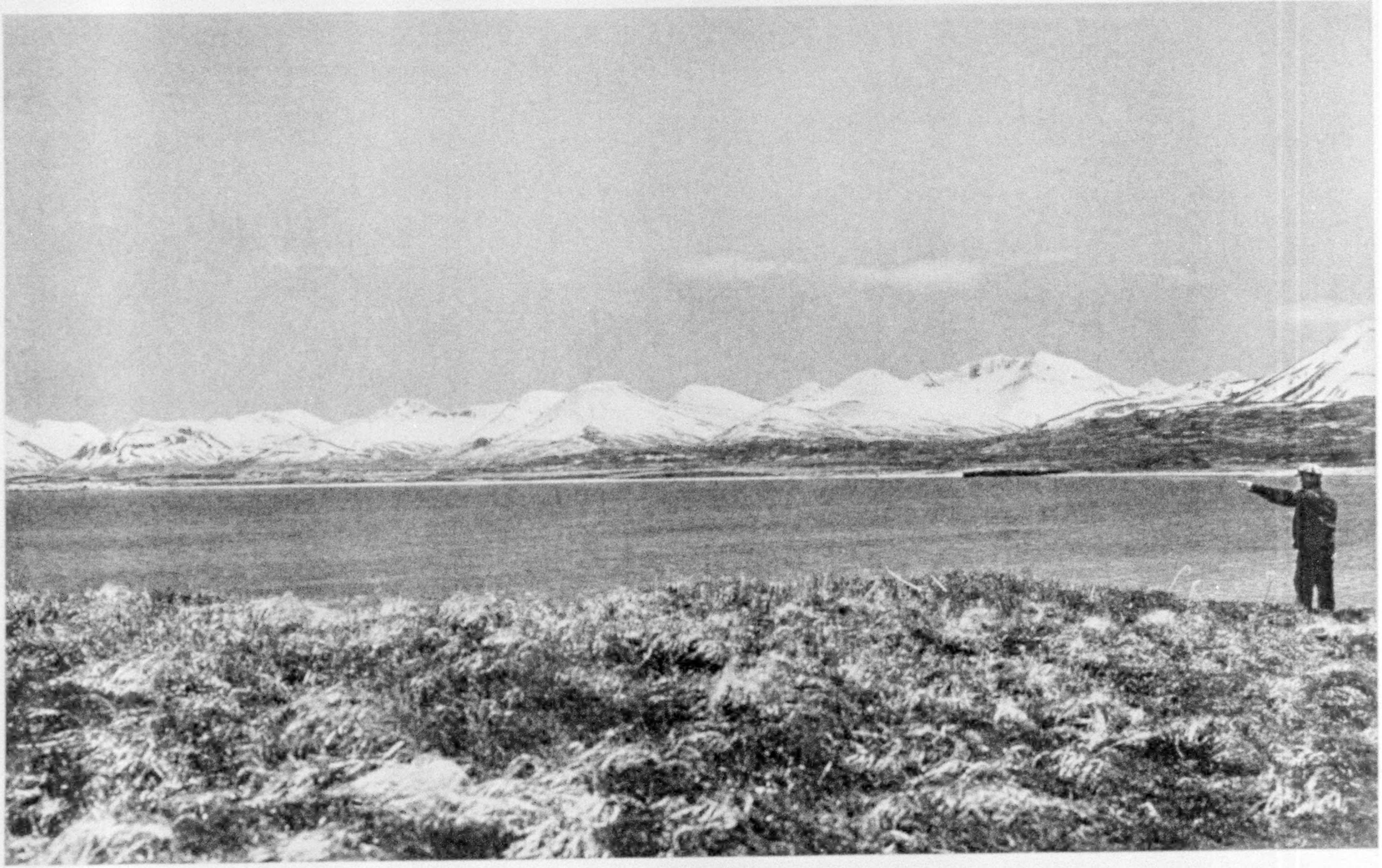
HERE THE PARTY WAS STORMBOUND FOR DAYS

Struck by a sudden gale that lashed the water to fury, the gasoline trolling craft *Geographic* was forced to take refuge in Ivan Island Harbor. After three days, food gave out and the members of the expedition sailed the catboat into Chinaman Lagoon, a fresh-water inlet, where they could obtain fish. Salmon, washed down by sugarless tea, was the subsistence ration for four days.



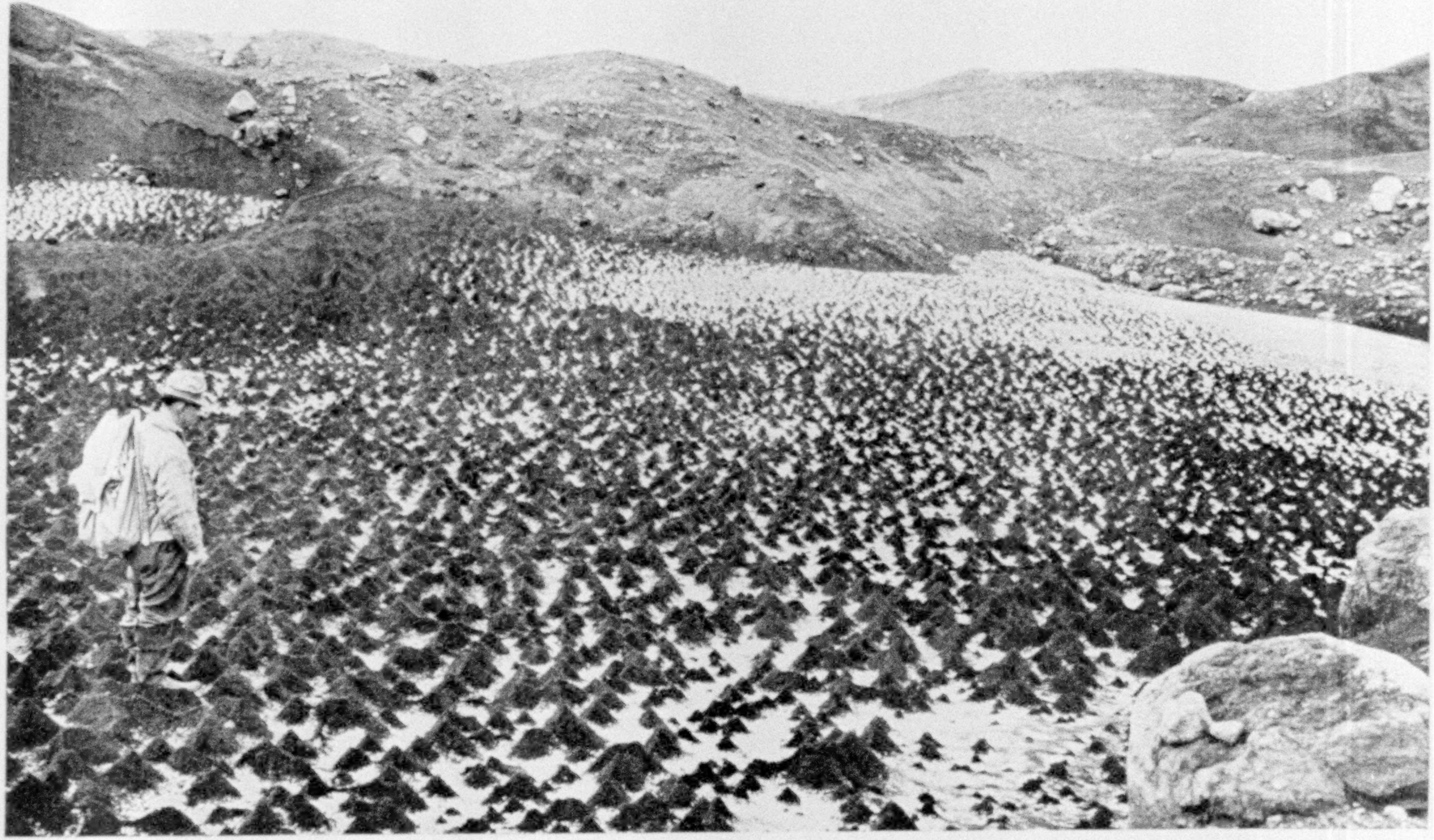
BEYOND GREEN MARSHES LOOM PEAKS OF ICE

Hague Volcano and Pavlof can be seen from Dushkin Lagoon only on clear days. Eight plates were exposed before a successful picture showing both volcanoes was made. The valley in the foreground, though lush with flower-starred grass that gives the appearance of solid turf, is a well-nigh impassable swamp laced with hundreds of streams and ponds. For nearly a month the members of the National Geographic Society expedition had to drink unpalatable water from still pools. Fortunately, water does not become stagnant in this climate.



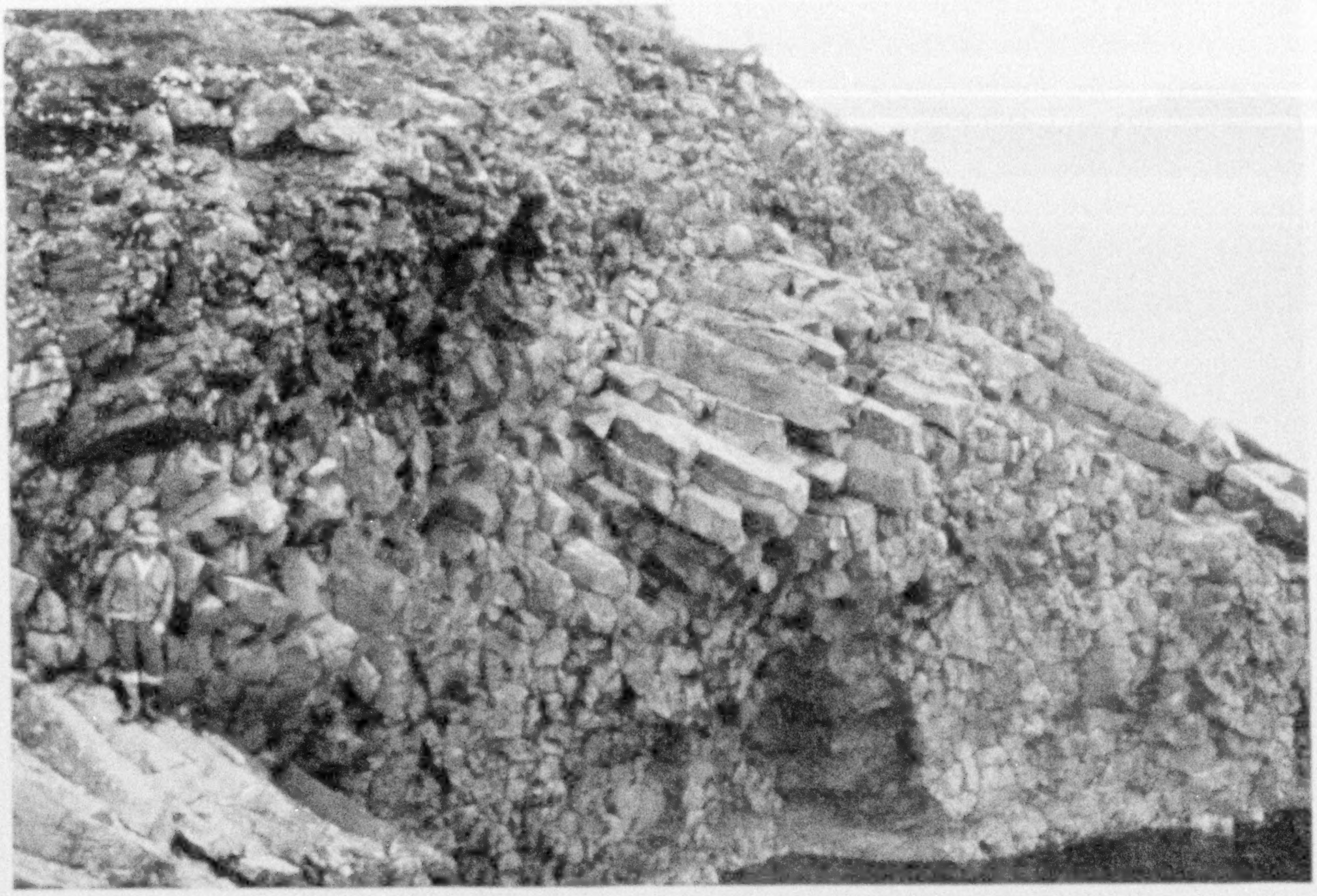
ETERNALLY WHITE IS THE SKYLINE

The cook is pointing toward the Pavlof Range and Ness Creek Camp, the base from which the National Geographic party operated for some weeks' time. Humps and depressions in the foreground are so thick as to render rapid progress impossible. Over this sort of ground the party had to tramp for miles, carrying heavy packs.



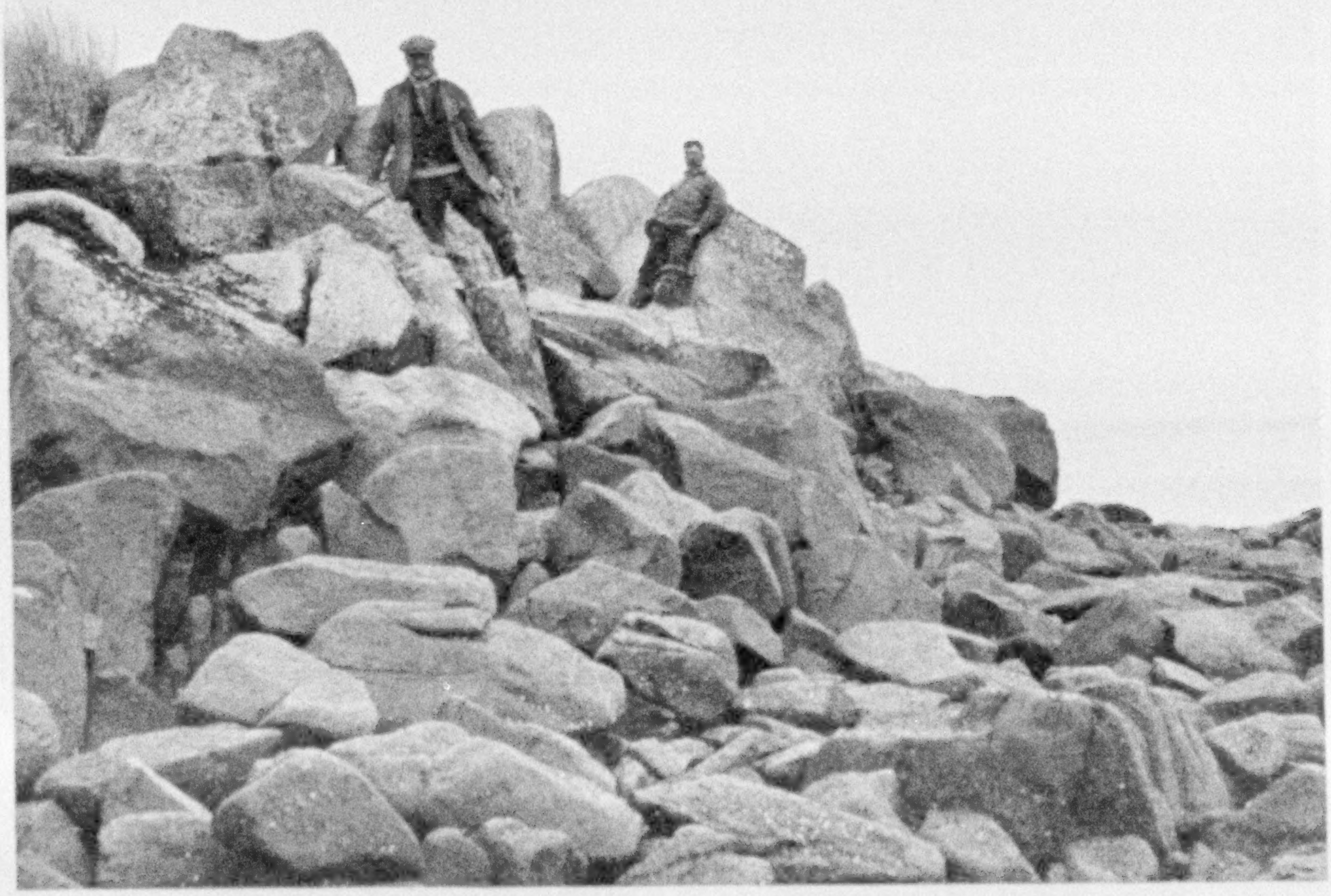
ASH-BLACKENED SNOW HILLOCKS IMPEDE TRAVEL OVER THE PAVLOF JUMBLE

Like shocks of grain in a harvest field, these sharp little mounds cover the valley floors among the ice mountains. Often they are so close together that stepping between them is impossible. Note the bowlders strewn over the surface of the hills of ice.



STONE SLABS ARE RICKED LIKE CORDWOOD

The "Columns," near Arch Point, at the head of Volcano Bay, presented one of the most peculiar formations the expedition found. Like the petrified woodpile of some prehistoric giant seemed this great heap of dark, slate-colored rock.

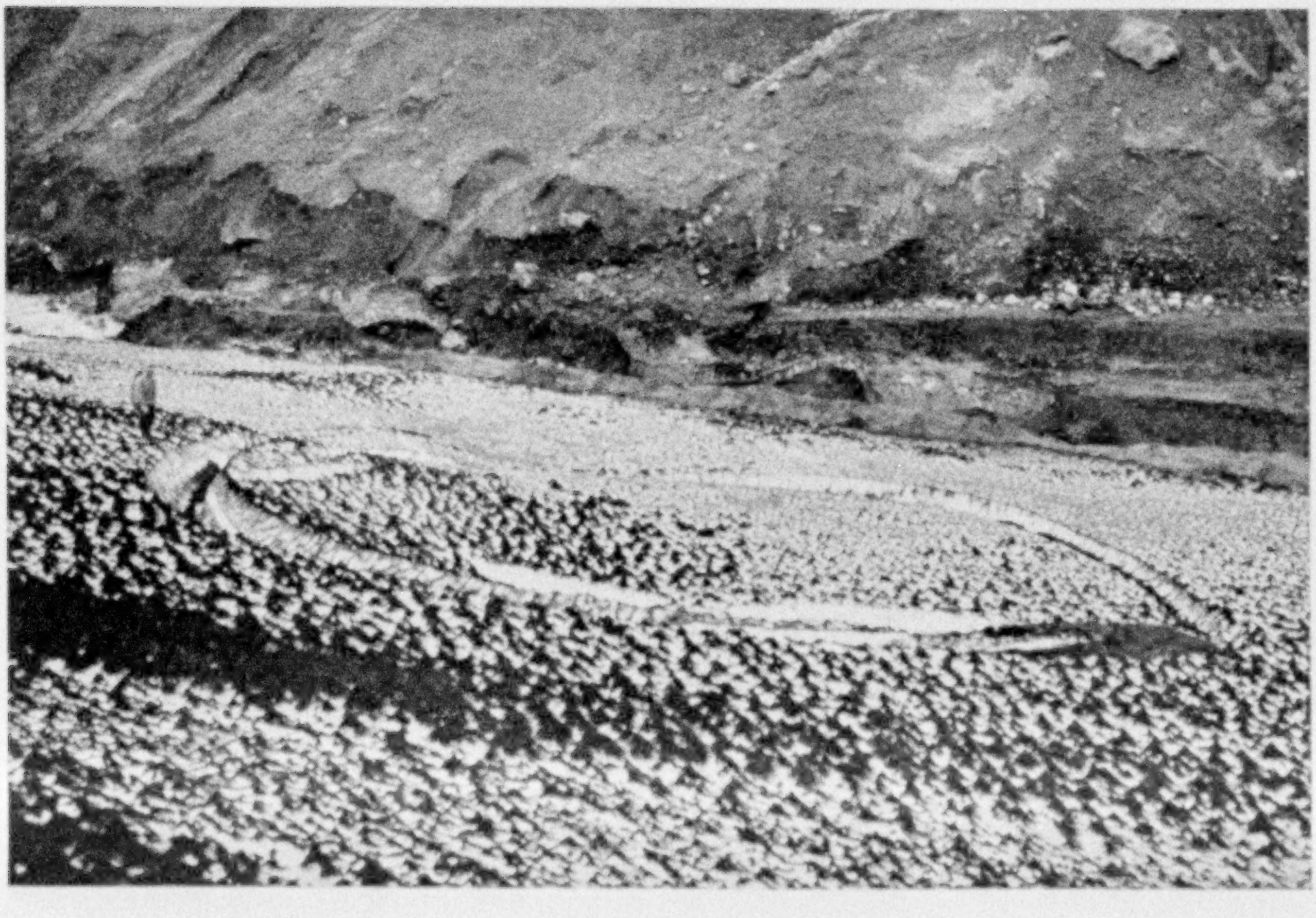


HUGE BOWLDERS FORM THE SEA WALLS OF ISLANDS IN CANOE BAY

Among these rocks thousands of gulls nest. The party found their eggs a welcome addition to the larder. These bowlders are a treasure-trove for the geologist (see illustration, page 120, and text, page 113).

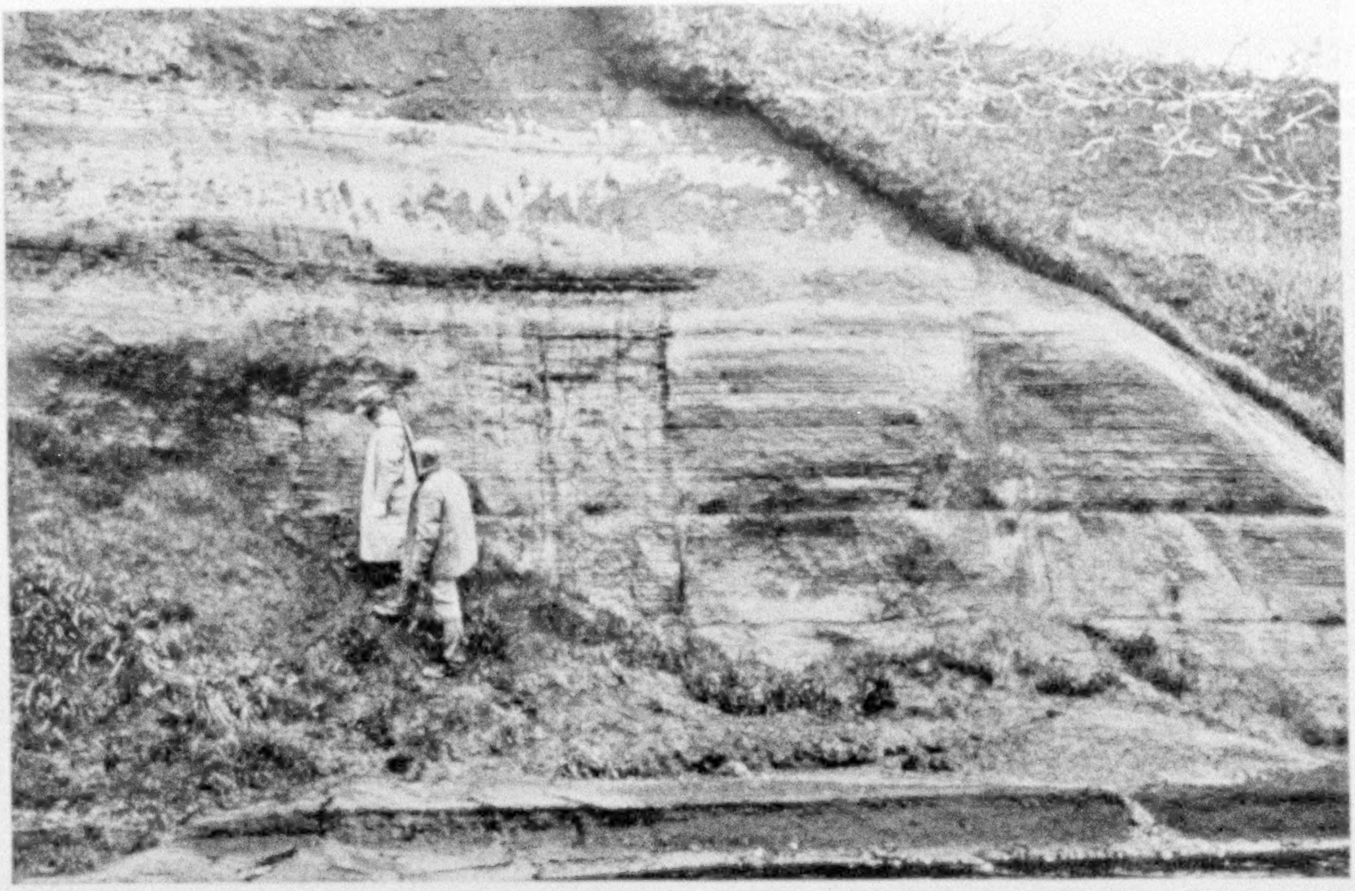
THESE ROCKS ONCE POURED FROM THE VOLCANOES

The author contemplates the purplish lava flow near Dushkin Lagoon. The pond and creek are typical of those found everywhere in this country. Pavlof and its companion volcanoes have erupted at intervals for centuries (see text, page 132).



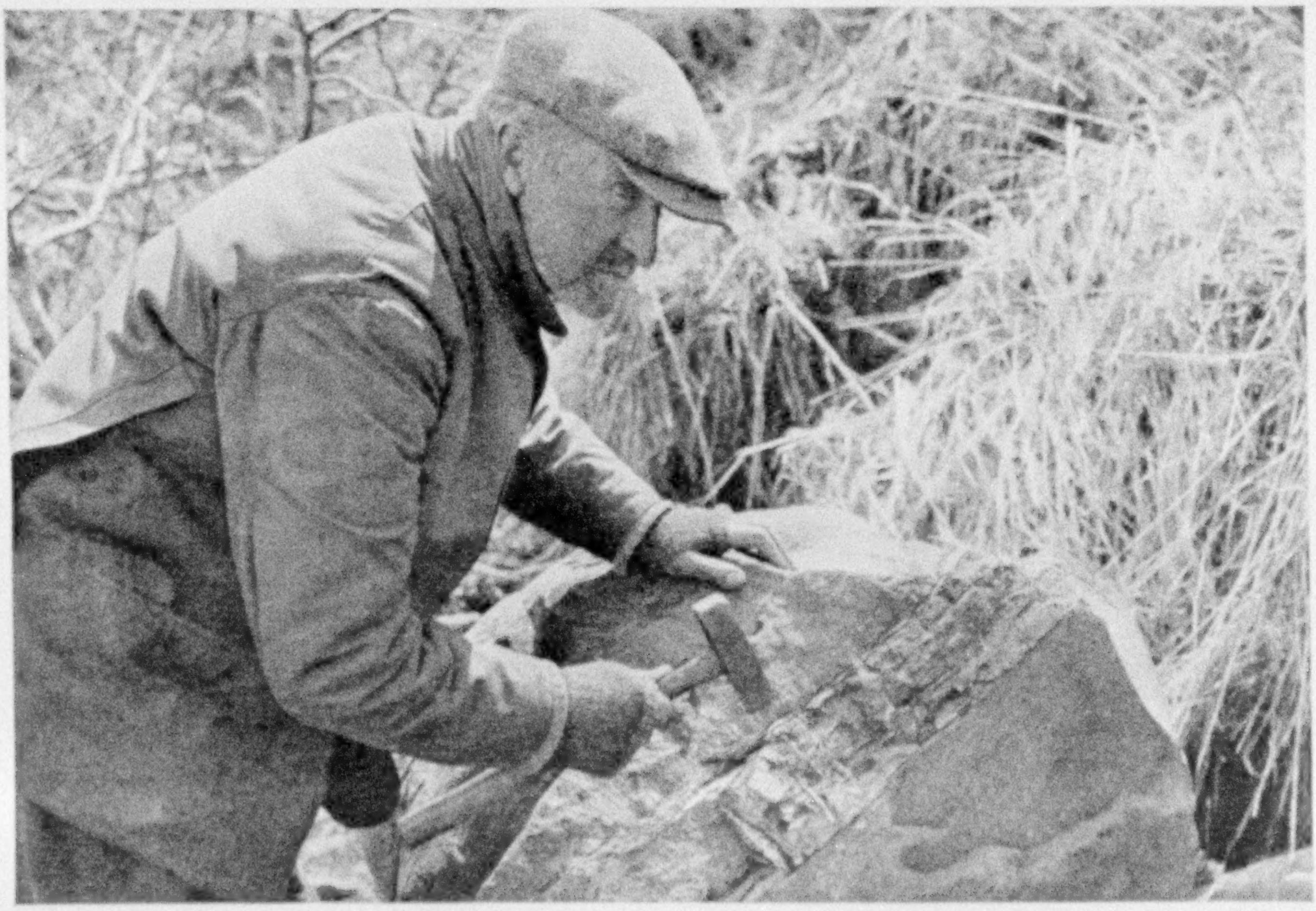
IN PAVLOF JUMBLE A FREAK, WHORLED CREVASSE WAS DISCOVERED

What caused the ice to crack in this peculiar manner could not be determined. The deep fissure formed a rough circle in a field of ice hummocks. The ice mountain in the background is blackened with volcanic ash (see, also, illustrations, pages 117 and 122).



STRATA OF COLORED CLAYS WALL CARIBOU VALLEY

Through the country east of Trader Mountain a narrow river flows in a bed a half mile wide. The cut banks of red and yellow indicate that at some time this stream has been a broad, swift flood.

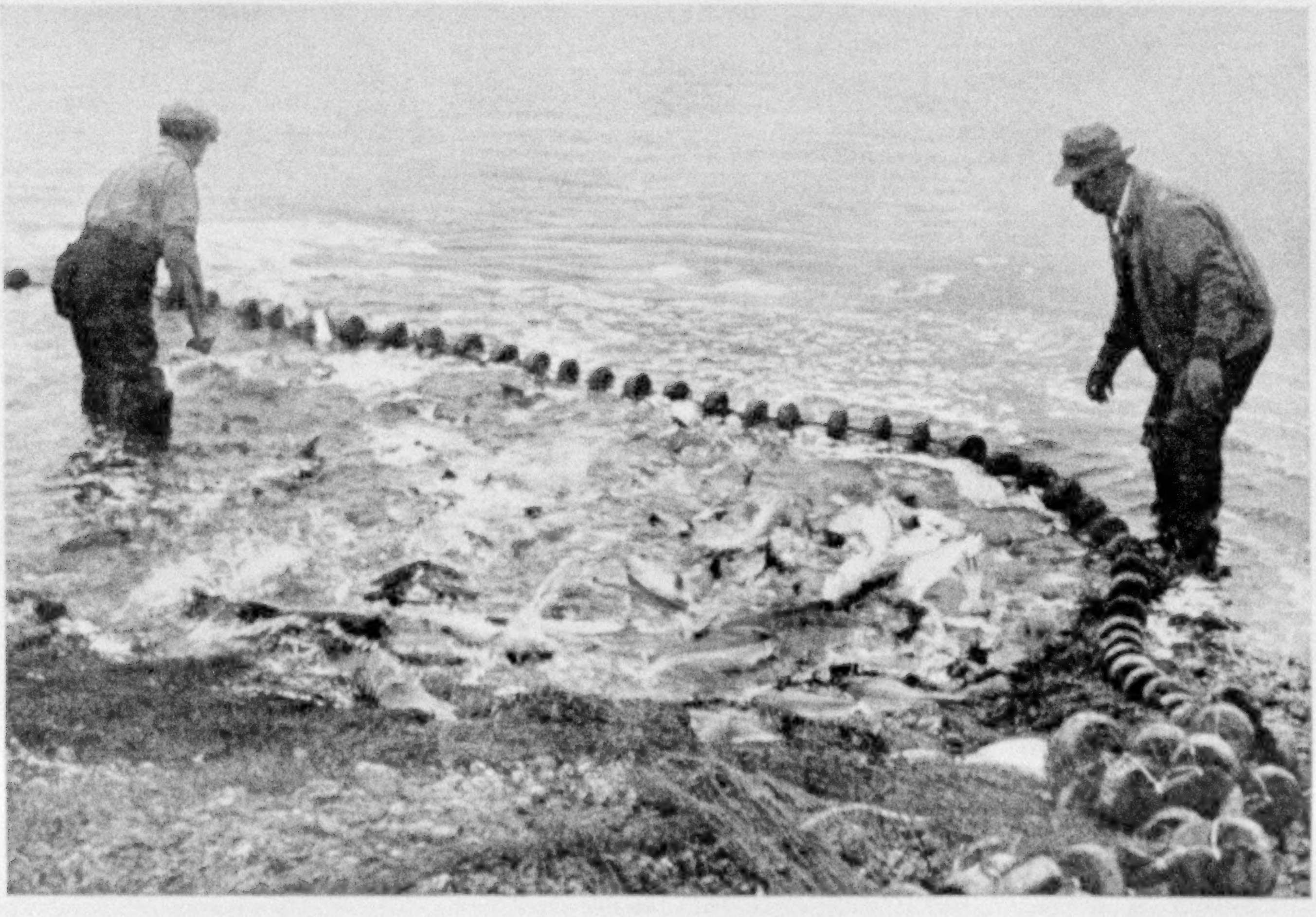


IN THIS COUNTRY THE ONLY TREES ARE FOSSILS

Among the bowlders on the sea wall of Canoe Bay the author obtained numerous specimens, proving the existence at some remote time of extensive forests in this now treeless land.

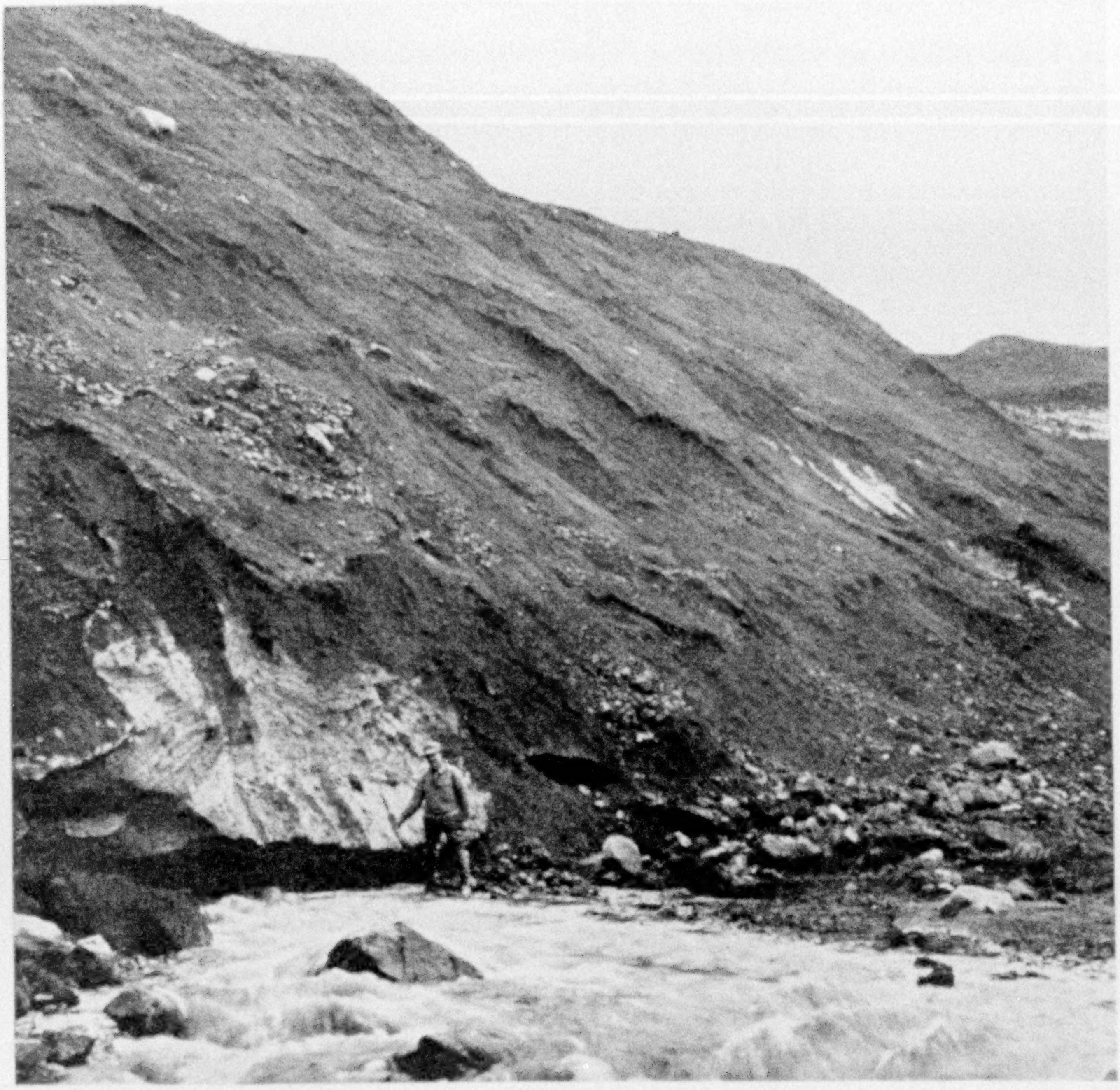
IT'S A LONG, HARD TRAIL TO BEAVER BAY

From Ness Creek Camp back over the mountains was an arduous journey. Ten miles was the longest distance covered in a single day. In the picture McKinley (right) and Yatchmeneff are ready for a fifty-mile trip with the pack horses.



THROWING BACK THE LITTLE ONES WAS NO HARDSHIP

From Jackson Lagoon a netful of fish was brought in whenever food ran low. Four or five of the best salmon would be selected and the rest of the catch set free.



TORRENTS GUSH FROM MOUNTAINS OF ICE OF PAVLOF JUMBLE

Waist-deep and very swift are the streams that emerge from caverns in these great ice masses. In crossing them the men had to join hands and proceed with extreme caution, for a misstep would have meant serious injury. The water is crystal clear, since only the surface of the ice is blackened with the volcanic ash (see, also, illustrations, pages 117 and 119).

across the stony beach to the sea, and off he would go for half the night by himself, living his life in his native element, only to return at dawn to his home in the box. Soon after daylight he would be clamoring again for trout.

There was more sunshine at the Canoe Bay camps between May 20 and June 8 than at any later time in the summer, but the weather was raw and cold in spite of this fact. The thermometer dropped to 34 degrees F. with snow on May 24; there was driving sleet on the evening of the 27th, and the next morning the country was covered with fresh snow.

June and July developed increasing easterly rainstorms, which made surveying and photographic work difficult, and August was almost continuously cloudy and rainy. We learned that for economy the scientist in southwest Alaska should provide laboratory work for rainy days and comfortable quarters for working.

THE MODERN EXPEDITION LIVES WELL IN THE FIELD

There is not a tree in the whole country surrounding Canoe Bay, but fortunately the wreckage of salmon traps by winter storms strews the beaches with good northwest pine, and alders provide firewood for interior camps.

OVER LIGNITE STRATA TUMBLE ICY STREAMS

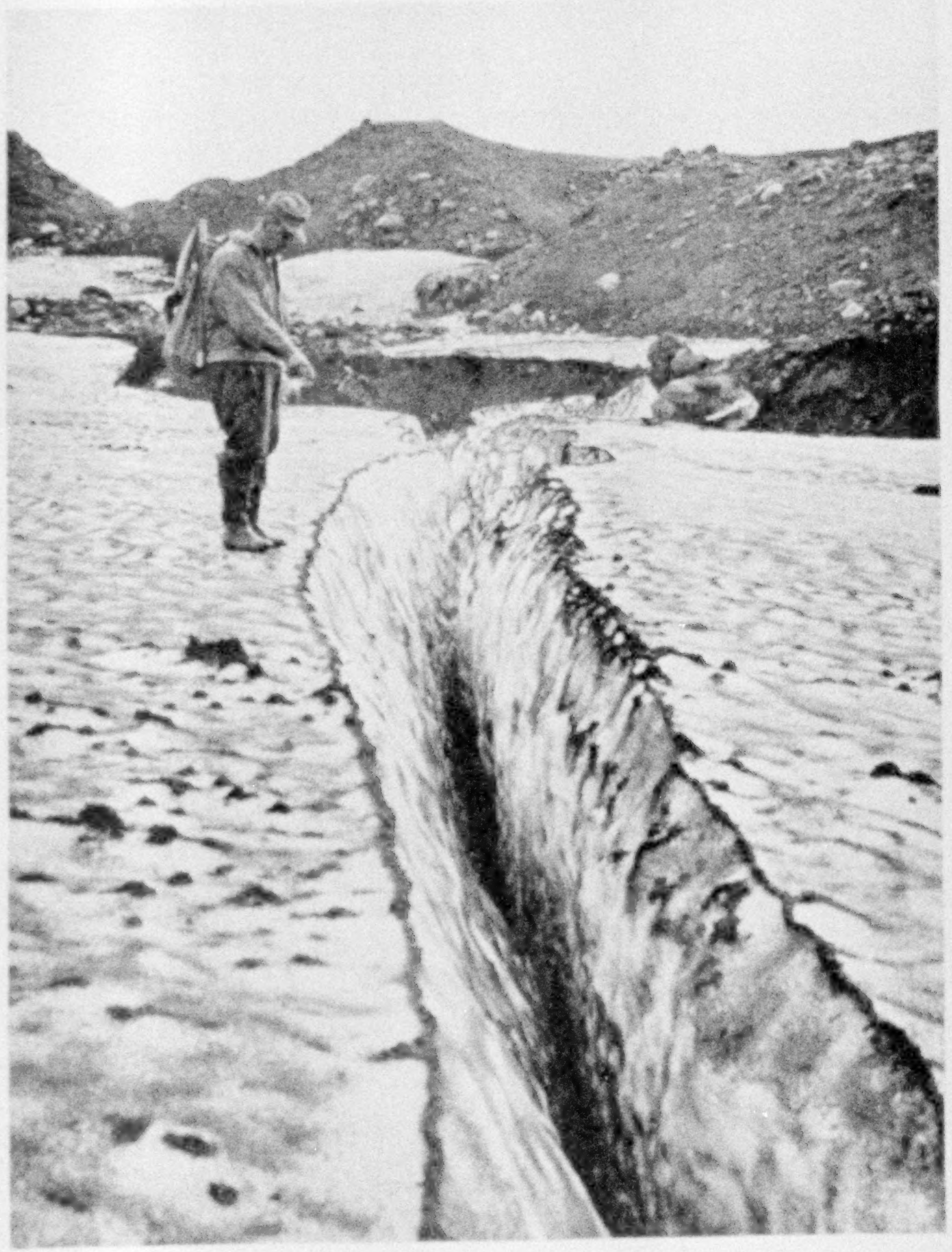
This great hill has so many cascades that the author has called it Waterfall Mountain. The alder brush in the foreground is dead, probably killed by volcanic gases, but grass, moss, and flowers mantle the rocks wherever a bit of ash has collected.

An expedition need suffer no hardships for lack of good food in base camp nowadays, thanks to eggs that keep, evaporated potatoes, canned sweet potatoes and spinach, evaporated eggs for inland trips, pea meal for soup, cooked ham without bone in large tins, powdered milk, and tinned butter of first quality. "Sourdough" hot cakes are essential for an Alaskan breakfast, and high-grade evaporated apples make applesauce almost indistinguishable from the products of fresh apples. Tinned goods offer an endless variety of soups, meats, jams, fruits, and vegetables.

Camp life was full of amusing incidents. The three A-tents were promptly labeled Doc, Dick, and Mac, for the leader, the photographer, and the topographer, respectively. The two large tents, each with a stove, became the "bull" tent and the cook tent, the former for conventions and the latter for feasts. Conventions were held chiefly to study film negatives, to discuss beasts and birds and fish, to sing quartets, and to tell stories that ranged from the Tropics to the Poles, and to ponder over McKinley's maps as they gradually took form.

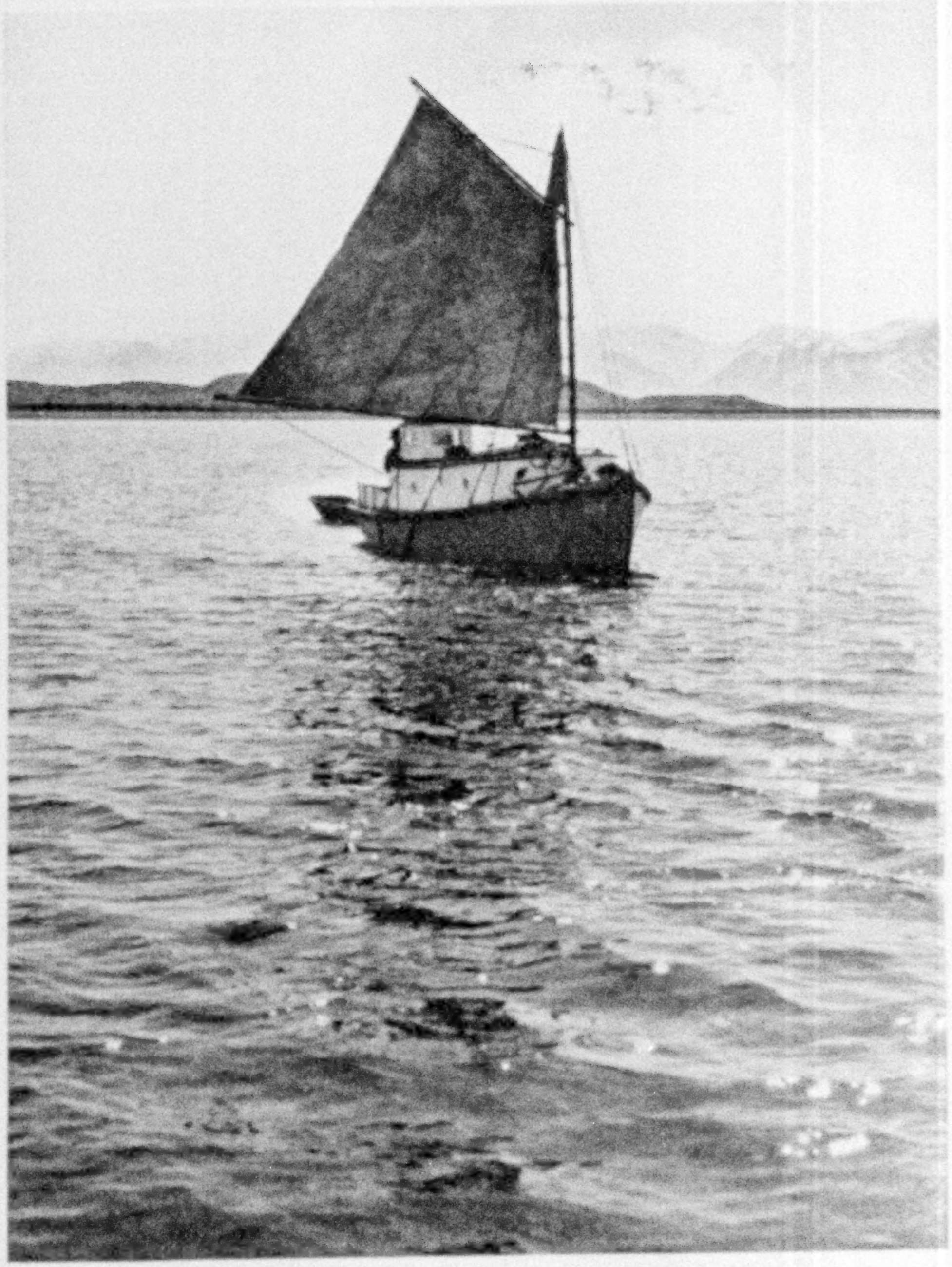
A RUSSIAN ALEUT BECOMES A COWBOY

Each topographic trip which McKinley and Yatchmeneff made with the two horses, Ted and Midget, was full of adventure.



ICE CREVASSES MADE TRAVEL PERILOUS IN FOGGY WEATHER

Though the chasm is only a few feet wide, it is perhaps 75 feet deep. On one occasion several members of the expedition were lost for seven hours in a fog while traversing the treacherous valley ice fields.



CANOE BAY IS LIGHT AT EVENTIDE

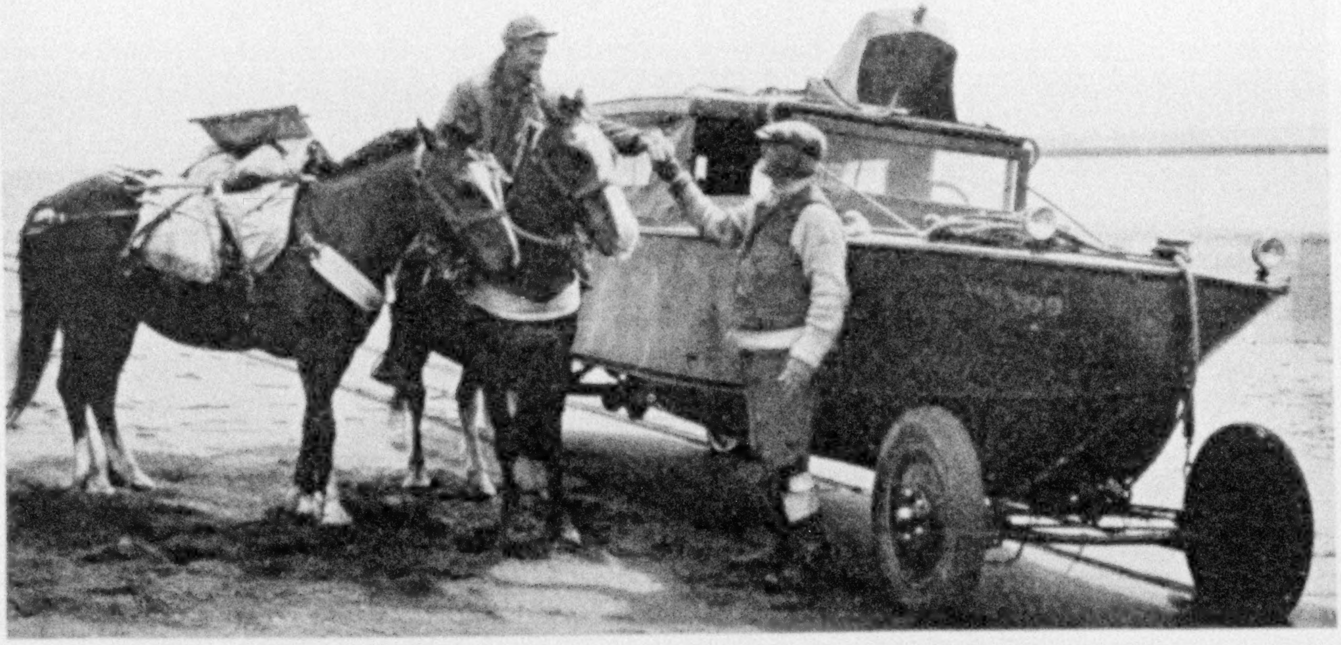
After a day of exploration at the head of this little inland sea, the *Geographic* is sailing back to Ness Creek Camp (see page 116). The water gleams with sunlight, though the hour is late.

MORE THAN A THOUSAND PLANTS WERE COLLECTED

Blue lupines, purple iris, white wild celery, and an endless variety of small flowers of every color weave a tapestry of transcendent beauty with the lush green of grass and the purple of tundra (see page 109).

NATIVE CHILDREN ARE CURIOUS

Wherever there is a fish cannery, youngsters of the Katmai settlement can be found watching the men at work. These boys are on the wharf at Squaw Harbor. Their smiles are characteristic of the Alaskan natives.



EVERYBODY BUT THE HORSES HAS LUNCHEON

The author is offering McKinley a bite to eat from the store carried in the *Honukai* on its long overland trip from Canoe Bay to Jackson Lagoon. The amphibian, in its other element, is shown in the illustration on the opposite page (see, also, text, page 109).

Yatchmeneff, son of the Russian Aleut chief of Unalaska, had never handled pack animals before, but he became a veritable cowboy in the course of the summer. The horses themselves thrived on the Aleutian grass and even the coarse beach grass attracted them.

On the first trip the mappers crossed the mountains to Beaver Bay. During this excursion of six days they saw 20 caribou, 3 foxes, and 3 bears. On their next trip, to the mountains northeast of inner Canoe Bay, they discovered 42 caribou and 3 more bears. They also climbed nearly to the summit of Hoodoo Mountain, a peak with fingering pinnacles.

The third camp trip of the mapmakers was the hardest of the summer. It took them into the marshy lands across the peninsula, from Canoe Bay Pass to Nelson Lagoon, an arm of Bering Sea. The horses went down again and again in muck, and on one occasion Ted capsized in a hole, with the precious instruments under him and his four legs in the air.

But McKinley knows how to handle horses. By sheer force the stranded beast was rolled over, hauled up by his halter and lifted by his tail. A sort of runway was dug for him with an ax, and, to the accompaniment of encouraging shouts, he gave ten jumps and was out.

On this trip McKinley first saw the long slopes of the foothills of Dana Volcano to the north and determined that the big mountains shown on old charts as near Nelson Lagoon were figments of an early cartographer's imagination. He looked out over 250 square miles of swamp lands and low ridges, with many hundred of lakes in the lowland area that separates Pavlof Bay from Bering Sea (see map, page 112). He and his companion came across a mother bear and three cubs and counted 40 caribou.

AN UNEXPECTED BEAR HUNT

May 31 was a day of unexpected adventure on Dana Volcano. We had crossed Canoe Bay, anchored the *Geographic*, and tramped up the long, hard, purple tundra slope, making our way through snow toward the cup crater (see page 127).

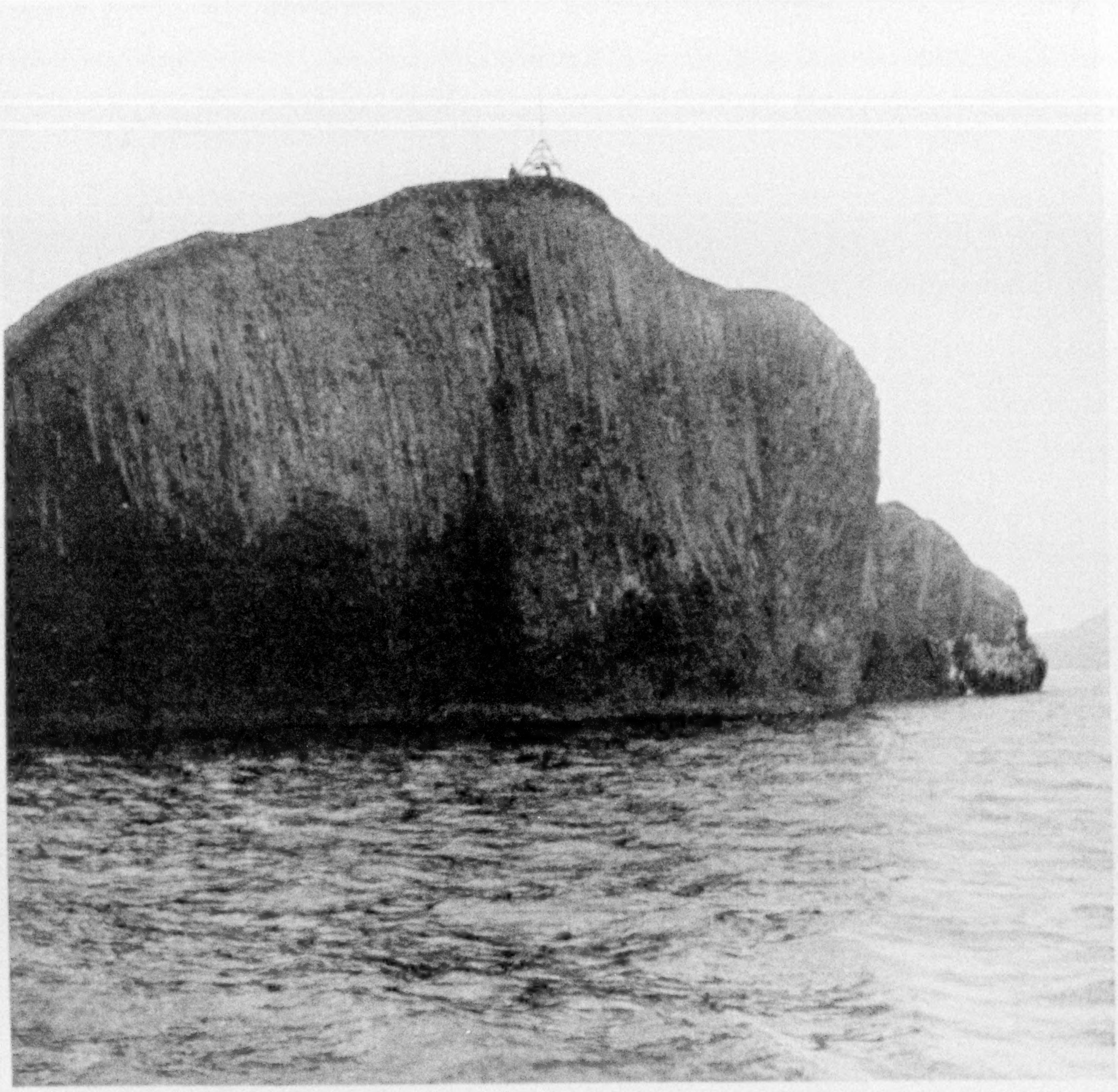
We could see the rugged horseshoe of cliffs back of the crater and wanted to get a view of a crater pond deep inside the bowl, which had been reported to us by a visiting sportsman.

THE AMPHIBIAN SWIMS PAST DANA VOLCANO

For short trips around Canoe Bay the *Honukai* was most useful. Looking down one evening from the snowy heights in the background of this picture, the party saw a marvelous display of color in this part of the bay, as the water reflected the myriad tints of the mountains.

BED TARPAULINS WERE SACRIFICED FOR PHOTOGRAPHY

Since it was impracticable to set up the black-cloth dark room in his tent, Mr. Stewart put it outside and covered it with the waterproof canvas intended to keep the bedding dry. So powerful was the wind that the seams of this makeshift had to be turned in to prevent the opening of light leaks. The taking of pictures was not so difficult, but how to get them developed was a real problem.



SIGNAL BLUFF MENACES SHIPS

Several craft were dashed to pieces against this promontory at the head of Volcano Bay before the lighthouse was established at Arch Point, a half mile to the right. Sailing the narrow channel among these treacherous rocks is perilous. The white dots on the point of the bluff at the right are terns, thousands of which nest in this far-northern sanctuary. On the top of the bluff may be seen a signal of the Coast and Geodetic Survey.

When a thousand feet up and well into the lower snowdrifts, Gardner suddenly stopped and asked for my field glass; then asked me to look in the direction indicated.

I looked and saw bear tracks a half mile away, leading to a dark depression, both tracks and depression being in deep snow.

"Well," said John, "that 'pit' is a bear."

He pointed out that as there were no tracks leading away from the hole, and there were tracks leading to it, and a bear had made the tracks, the bear was still there. Relentless logic.

A big bear was highly desirable for our natural-history collection, as the season was right for the best of fur.

We reached the tracks and I measured one; it was 16 inches long and 9 inches wide! I was faced with the necessity of turning hunter for the time being; so I told John to lay out the hunt. I had with me a Neumann 3-barrel gun and 10 cartridges for the rifle barrel.

The wind was blowing down the mountain and the bear was on the hillside to the right of the spur we proposed to ascend. It is the habit of these animals to sleep during the day high among the snows, and come to lower levels in the

LOOKING WEST ACROSS PAVLOF BAY

From Canoe Bay Camp the party climbed a mountain to obtain this view of Pavlof Volcano and Pavlof Sister. The author and John Gardner are standing at the extreme right, on the edge of a sea of mud and small bowlders. This mud field is at the top of the peak, and to escape being mired the hikers had to keep to the snow.

evening or early morning to feed on plants, berries, fish, or whole families of ground squirrels. As it was midday, we knew he would not stir unless he scented us.

We clambered across a gulch and up a snow slope, going in up to our knees. Finally we reached the top of a spur. To our right, halfway down a steep snow-covered slope, was the sleeping bear. He lay in a round pit of his own digging, and below was the bottom of a V-shaped gulch, lined with snow except for one or two patches of slide-rock.

THE BEAR BECOMES A "SPECIMEN"

We crept out on the angle at the top of the slope and had a look at our quarry. He lay flat on his back, 300 yards downhill, his head toward us, his paws folded on his tawny chest, his sharp nose resembling that of a big collie dog with an unusually big ruff. He was uneasy, moved about a little, and lifted his head. Perhaps he heard or smelled something; but we were down wind and we withdrew on a higher spur, approaching to within 100 yards.

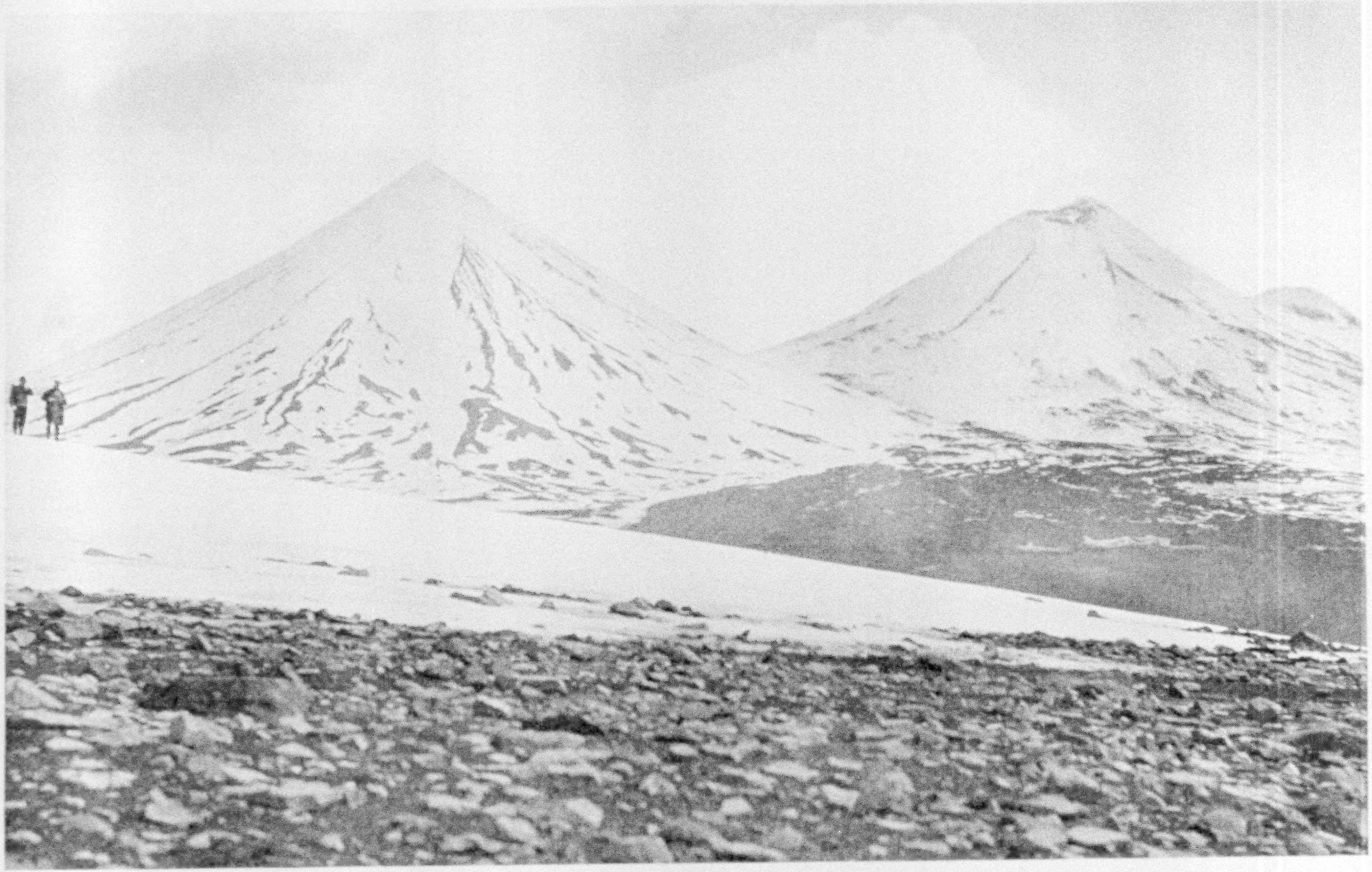
I shall not enlarge upon my prowess as a marksman. Suffice it to say that all of the rifle cartridges were fired before the bear became a "specimen" instead of a menace.

It required the united efforts of our party to roll him out of his pit down to the bottom of the glen for skinning. He measured 9 feet 10 inches from nose to tail, 12 feet 10 inches across the diagonal, and the head was 2 feet 2 inches long.

The next day we returned with the amphibian truck, crossing Canoe Bay as a boat, mounting the beach, grassland, and hillslope as a truck, and climbing to an elevation of 400 feet, from which point we continued two hours on foot.

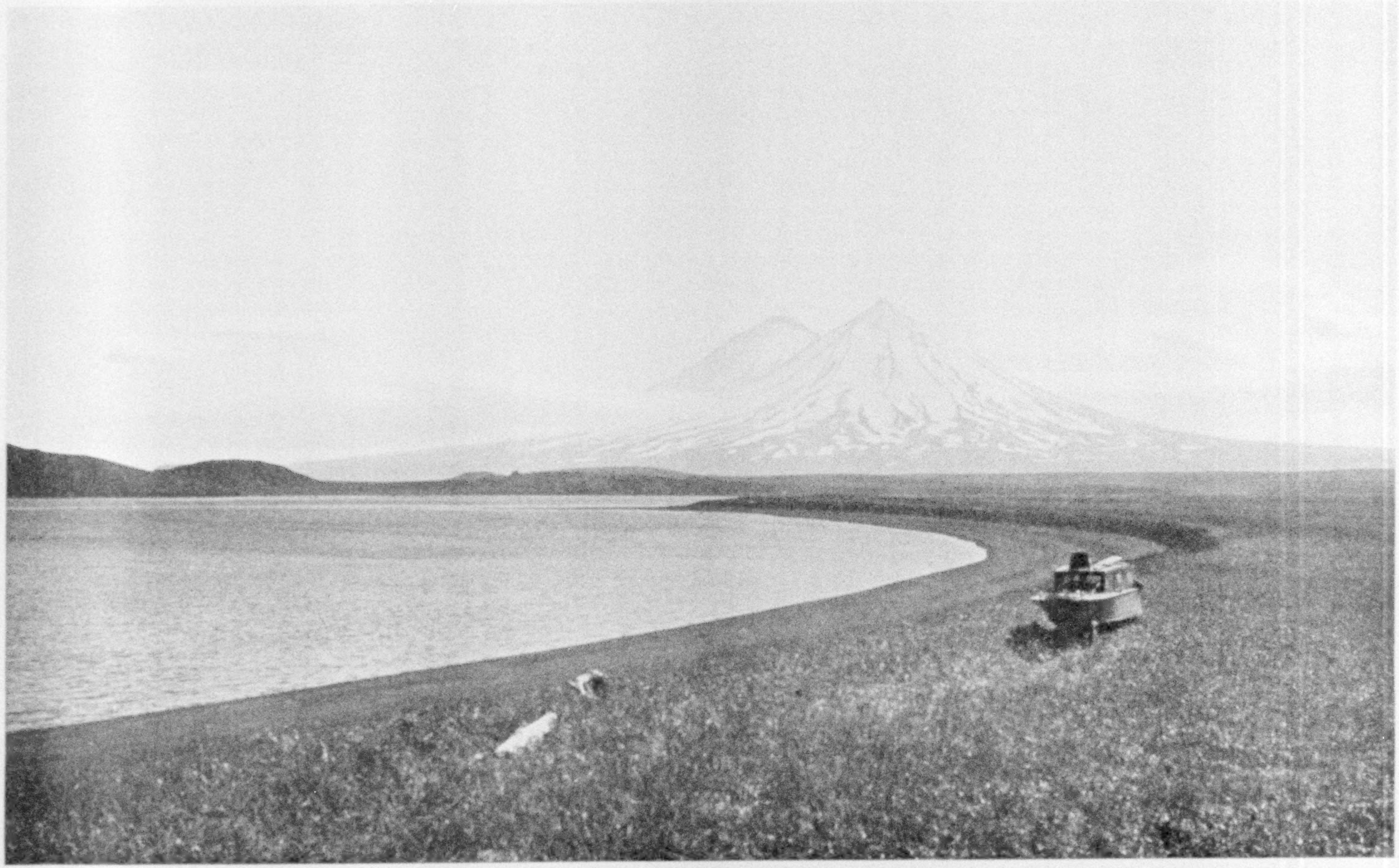
VOLCANO STUDIES CENTER ON PAVLOF

The carcass of our trophy suggested a mighty pugilist, with gigantic biceps and leg muscles. As he was skinned for mounting, skull and leg bones were preserved, and John carried the hide, while the rest of us took the bones back to the *Honukai*. The skin was a very heavy pack; I could barely lift it.



PAVLOF AND ITS SISTERS LEAP FROM THE FOG

For half a day the members of the expedition had tramped without seeing anything but rain and mist. Then, as they looked south from the slope of Trader Mountain, the air cleared in an instant, and Pavlof and its neighbors stood out sharply, only five miles away. The dark area at the base of the peaks is the jumble. In the foreground is a stretch of soft mud and bowlders that defies the hiker. It was necessary to keep to the snow in crossing this sort of country.



IT IS EASIER TO TAKE PHOTOGRAPHS OF PAVLOF VOLCANOES AT NIGHT THAN IN DAYLIGHT HOURS

In this land of fogs and clouds and midnight sun the atmosphere is clearest about 9 p. m. Then the gray mist lifts as at the touch of a magic wand and sunlight breaks through for a few minutes. The *Honukai* is here a land craft at the edge of Jackson Lagoon, with the Pavlof volcanoes in the distance. This photograph was made at 7 p. m.

TRAPPERS' CABINS OFTEN AFFORDED A LODGING FOR A NIGHT

There are no such things as locks in this part of Alaska. When out on long hikes, the party frequently used deserted shelters of sod and driftwood, known as *barabaras*. Such sleeping quarters were not the tidiest in the world, but were more comfortable than the open ground.

The specimen has been presented by the National Geographic Society to the Cleveland Museum of Natural History.

Our volcanological studies for the summer centered on Pavlof. In May and June we had several fine days when from hilltops we had looked across Pavlof Bay and had seen the two snowy cones of Pavlof and Pavlof Sister, a pair of perfect white pyramids side by side, with a smaller mountain of twin rounded breasts, known as Trader, off to the north.

The facts about the activity of Pavlof Volcano are hard to obtain, for natives, mariners, and fishermen rarely remember dates.

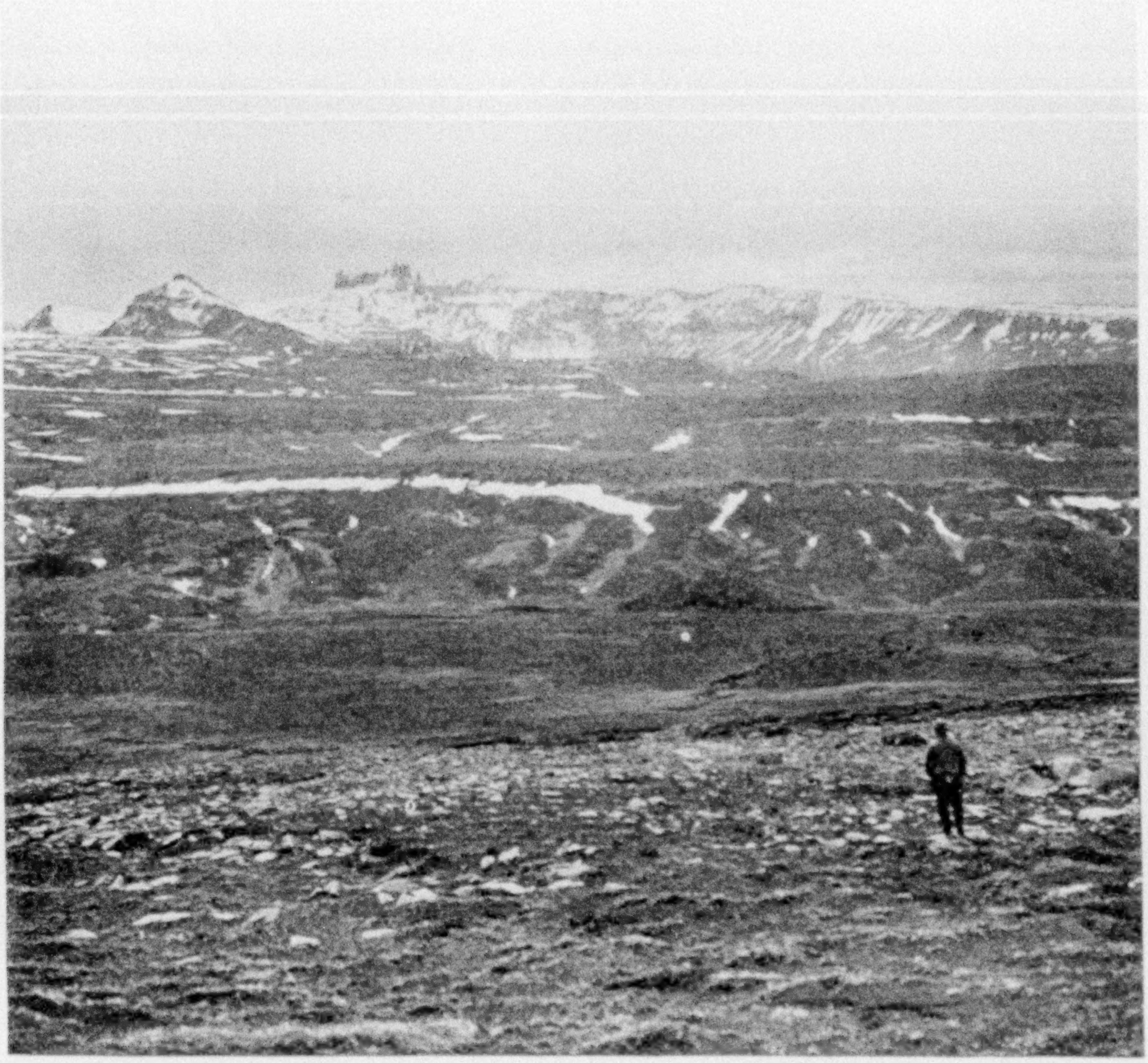
Pavlof was smoking vigorously from 1906 to 1911, according to an island trapper. Some time in 1911 "fire" poured down the mountain and alarming rumbles continued for several months. Bowlders were thrown into the air. The mountain was reported to have cracked open toward the north.

Reliable observers on the island of Unga report that an alarming roar was heard, waxing and waning, on the night of December 6-7, 1911, between 8 p. m. and 4 a. m., and that noises were heard for four days. A series of earthquakes was recorded by a competent observer on December 31, 1911, at 12:45, 6 and 7:15 a. m., and at 8:45 p. m., at Unga.

The U. S. Commissioner at Unga gave me black sand that fell at Unga from Pavlof in eruption July 6, 1914, between 2:30 and 6 p. m. The commissioner is a radio amateur of note, and the wireless operator at Port Moller, on the Bering Sea side of the peninsula, reported to him in 1914 that he could see several volcanoes erupting. The ash caused complaints by getting into merchandise and machinery. The sky over the Shumagin Islands was darkened and two inches of sand fell.

There were more eruptions of Pavlof in October, 1917, with dust falls, and a severe earthquake at King Cove. And yet others, when the mountain showed "flames," in the winter of 1923.

So we have Pavlof smoke in 1906, big outbreaks in 1911 and 1914, activities in or near 1917 and 1923. Reports indicate that probably there were sympathetic



THE AGHILEEN PINNACLES, FIFTEEN MILES DISTANT

Twice the photographer of the expedition made arduous trips to get nearer pictures, but both times, after struggling for miles with heavy camera equipment over rough terrain, impenetrable fogs closed down upon this wonderful formation—a gigantic natural cathedral of spires and towers (see text, page 134).

eruptions of other volcanoes, both east and west, in 1911 and 1924. These facts suggest volcanic outbursts in this region every four and a quarter years at least.

Shishaldin and Akutan, two volcanoes to the westward, were "smoking" and "flaming" more in 1928 than they were in 1927. As it is now more than four years since 1923, the last of the Pavlof dates, it is probable that it will soon erupt again.

The active period, 1906-11, corresponds with the term of Bogoslof's great activity. Bogoslof resumed lava heaping and explosions in 1926-7. Therefore, if there is sympathy between the Bogoslof and Pavlof vents, this is another reason for expecting a Pavlof eruption now.

June 26, 1928, all members of the Pavlof expedition took their beds on their backs, piled tents and food on the horses, and clambered up about nine miles, to a creek in the alders on the east side of Trader Mountain.

ARRIVAL AT PAVLOF VOLCANO

A few days later we moved camp to a still more advantageous site, Divide Lake, at the foot of the snowy slopes of Pavlof.

As the boys were making camp at the first of these places, I was trudging behind, across an open meadow. I stopped to rest, took out my field glass, and scanned the face of Trader.

To my delight, there appeared three

Kodiak bears on a snowdrift. There was a mother bear above and two year-old cubs below, all bounding along the snow, alarmed by the campers. When the cubs would lag, the nervous matron would jump down and cuff them to hurry; and so they disappeared up the mountain.

No pen can describe adequately the panorama when the clouds lifted before our camp at Divide Lake June 28. On the left and close at hand were the exquisite, penciled cones of Pavlof Sister and Pavlof, much alike and glistening with ice, separated by a high saddle of crevassed névé. In the north face of Pavlof, the side toward us, was a mighty gash or split, where the whole north rim of a former circular crater had fallen away. This let us see right inside the crater, which is about a quarter of a mile across.

Inside the opening lazy steam arose from an inner black cone, and from the contact of an inner lava field with a ring-shaped outer black cone. The little inner cone could be seen in perspective, with the lava field around it. The cup on top was like the cinder cone at Lassen National Park.

The outer ring was broken, in cross-section, falling away at the gash.

Outside still farther were the jagged rocky walls of the collapsed great crater, with snowy lips. This outer collar opened down the north side of the mountain just as a man's waistcoat opens at the throat, and so revealed the inner ring cone as the shirt collar and the innermost conelet as the cravat.

Pavlof Sister showed a snow-filled gash and a lava plug at the top.

Under Pavlof crater, at the base of the cone, is a high, lumpy jumble two miles wide and a mile deep in a southerly direction, grading up into the pure snow slopes of the mountain. At first sight one would mistake this jumble for a clinkery lava flow or a glacial moraine. Its front is a hundred feet high and its black hillocks of andesitic gravel and bowlders a hundred feet higher still.

Out from its abrupt front emerge three or four streams across a flat black wash plain. The water comes from ice caverns under the jumble.

The jumble proved to be the chaotic product of explosions at an angle from the crater, bombs and blocks, gravel, sand and ash, mixed with ice and snowdrifts, partly true glacier and partly winter snowfall (see pages 117 and 119).

THE AGHILEEN PINNACLES

On the west flank of Pavlof's immaculate slope is Pavlof Little Sister, a subsidiary vent, making a soft white lump that breaks the severity of a geometric pyramid (see pages 129 and 130).

Farther to the right of Pavlof are Hague and another peak, both snowy volcanoes, each as high as Vesuvius, while Pavlof is twice as high (8,222 feet).

Now we look yet farther to the right and see something unbelievable, so fantastic, so marvelous in sculpture, so delicate in outline that nothing in scenery elsewhere remotely resembles it—the Aghileen Pinnacles (see page 133).

The virgin whiteness of the Pavlof group is replaced by a tremendous turreted cathedral hemmed in by smooth-topped escarpments on the Bering Sea side and the creamy Pavlof ensemble on the other. It is a vast architectural pile of jutting black minarets, spires, columns in clusters, towers, and domes, with snowdrifts in the crannies.

From the great square tower in the middle of the cathedral mass rise individual steeples, slender and straight-sided, like Giotto's campanile, only thinner. It seems incredible they do not fall with the first breath of wind; yet they have withstood for centuries Arctic gales from Bering Sea.

It is Nature's cathedrals of Milan, Venice, Salisbury, Rheims, Cologne, and Canterbury in one, all built high on a mountain in one of the loneliest places on earth, with a group of Fujiyamas standing guard.

The composition of these and other formations in the vicinity of the Pavlof group enabled the expedition to gather a vast amount of valuable data for intensive laboratory study, which will be given to the scientific world later in technical papers.

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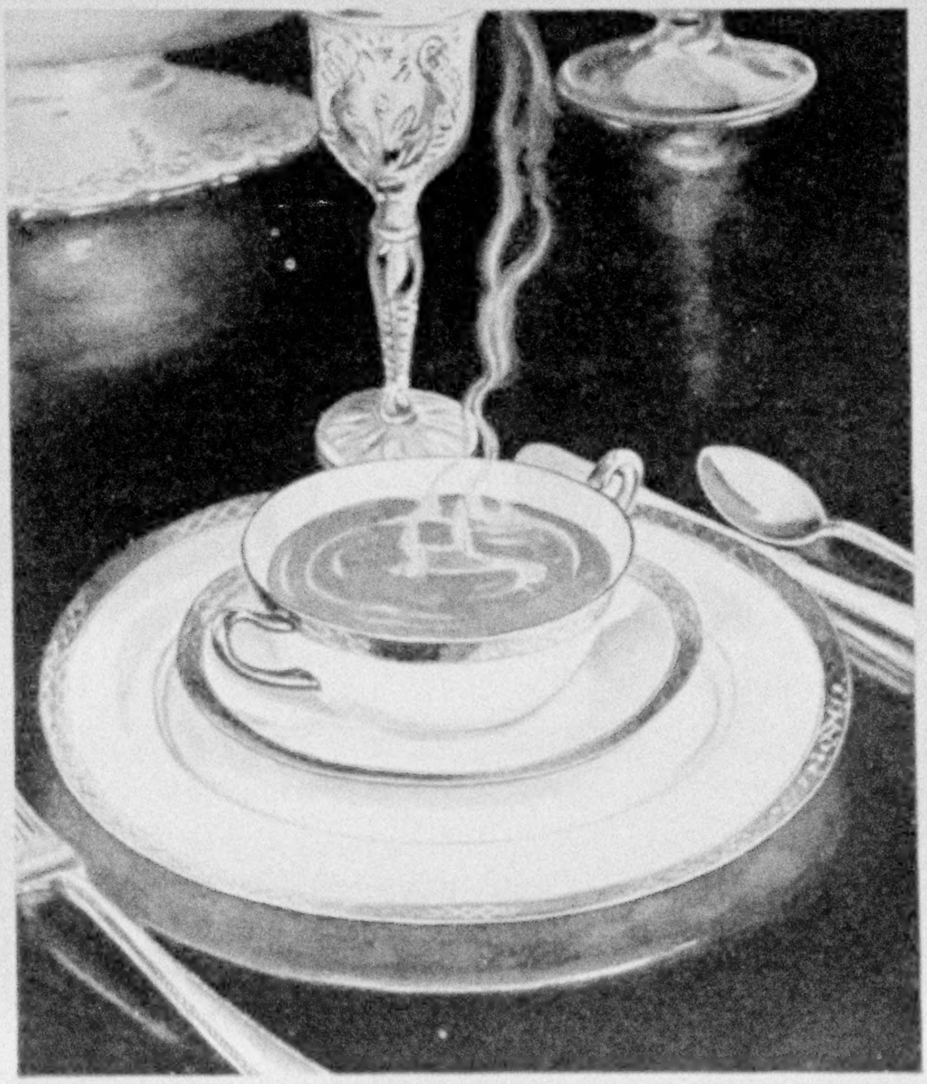
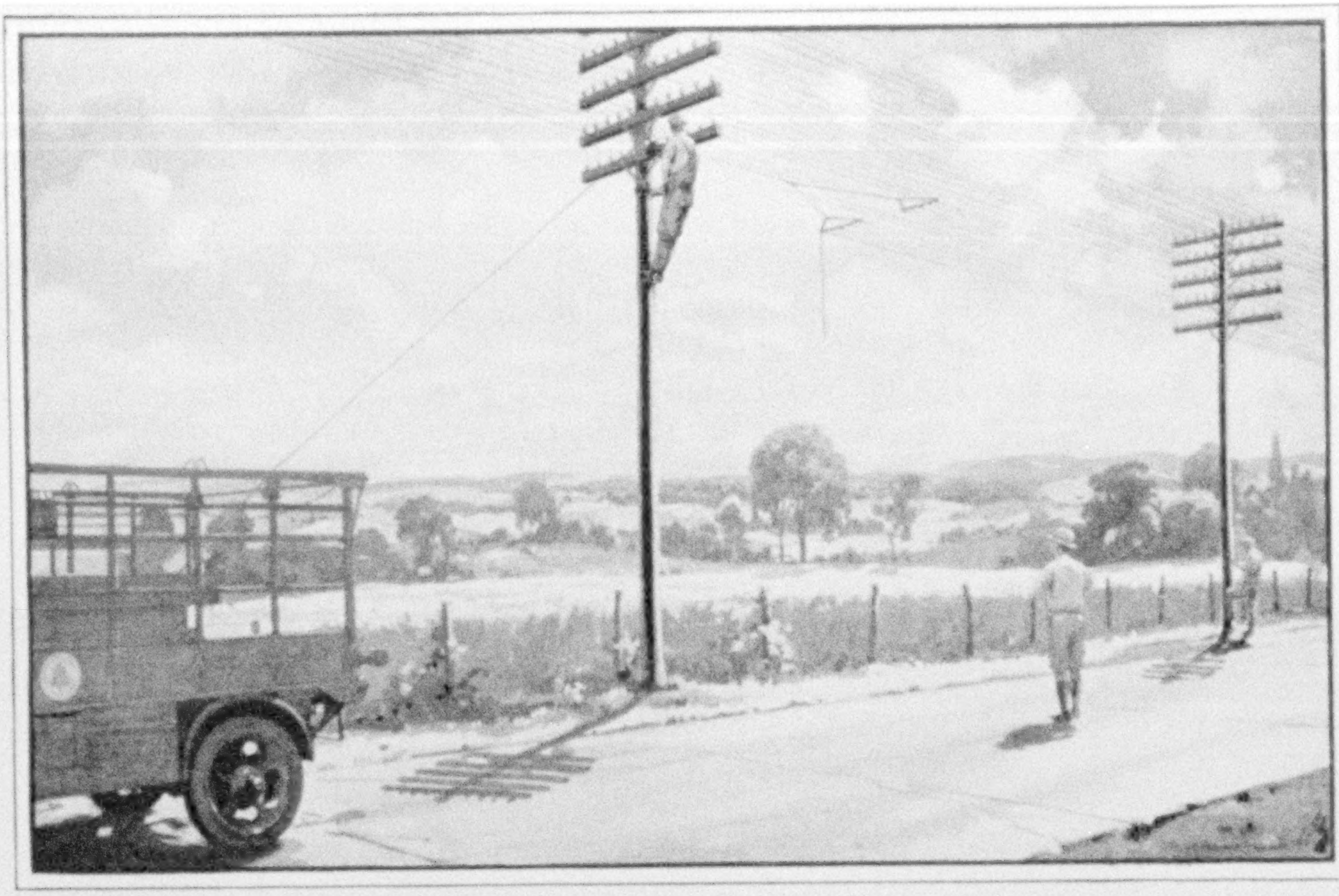


WITH THE MEAL OR AS A MEAL SOUP BELONGS IN THE DAILY DIET



The U. S. A. is only a few minutes wide

An Advertisement of the
American Telephone and Telegraph Company

In the gold rush year of '49 a stagecoach succeeded in crossing the continent in about three months. Two decades later, for the first time, an unbroken stretch of railroad lay from New York Harbor to San Francisco Bay, and America was seven days wide. Today, by telephone, that entire width is only a matter of minutes. And these few minutes represent a round trip, taken in the ease of office or home.

The Bell System is ever busy reducing the width of America and the distance between cities. For example, during 1929 it will add to its lines nearly 2,000,000 of the new permalloy loading coils for correcting and maintaining the speeding voice currents.

Seven thousand miles of new inter-city cable, $40,000,000 worth, will be added to the System to protect against storms and other slowing up influences.

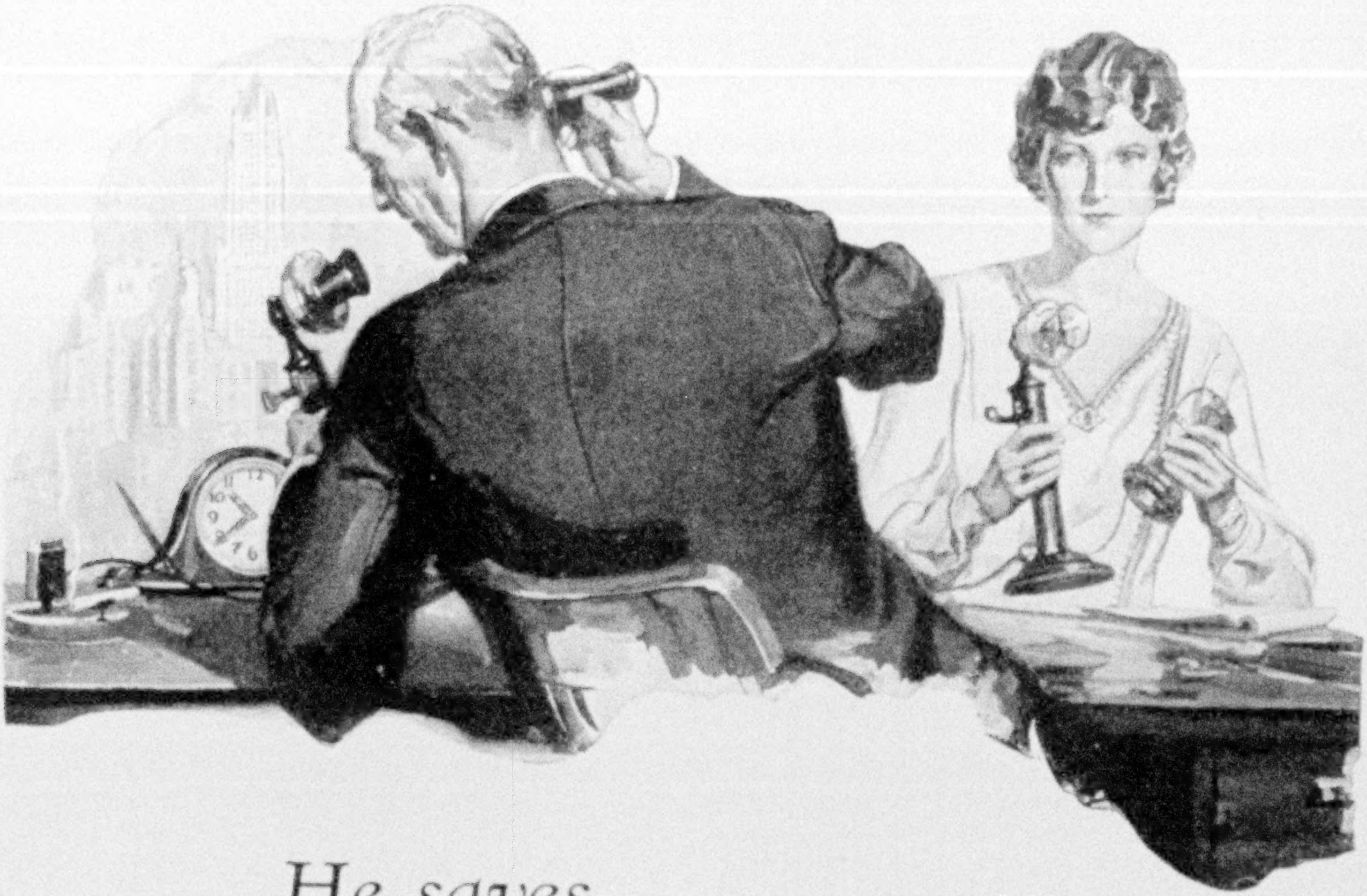
In the last five years 350 major improvements, as well as thousands of others whose aggregate importance mounts high, have been made in telephone central office equipment.

Improved operating practices have eliminated the necessity of your "hanging up" and being called back in 95 per cent of toll and long distance calls, adding new speed and ease to out of town calling. You hold the wire and the operator does the rest.

Since New Year's Day, 1927, the average time for completing all out of town calls has been cut 35 per cent and at the same time the per cent of error has been further materially reduced.

There is no standing still in the Bell System. Better and better telephone service at the lowest cost is the goal. Present improvements constantly going into effect are but the foundation for the future's greater service.

"The Telephone Books are the Directory of the Nation"



He saves investment time and worry —so can you

The tempo of modern life is too fast to allow for much "shopping around." You save time and worry by going direct to reliable houses for nearly everything you purchase—your clothes, your automobile, your furniture, your investments. In buying securities you naturally rely upon the counsel of one or two investment houses in whom you have confidence. We invite you to use The National City Company's world-wide knowledge and experience when purchasing new securities, and when reviewing your present investments. Your telephone keeps you in quick touch with this service in 50 American cities.

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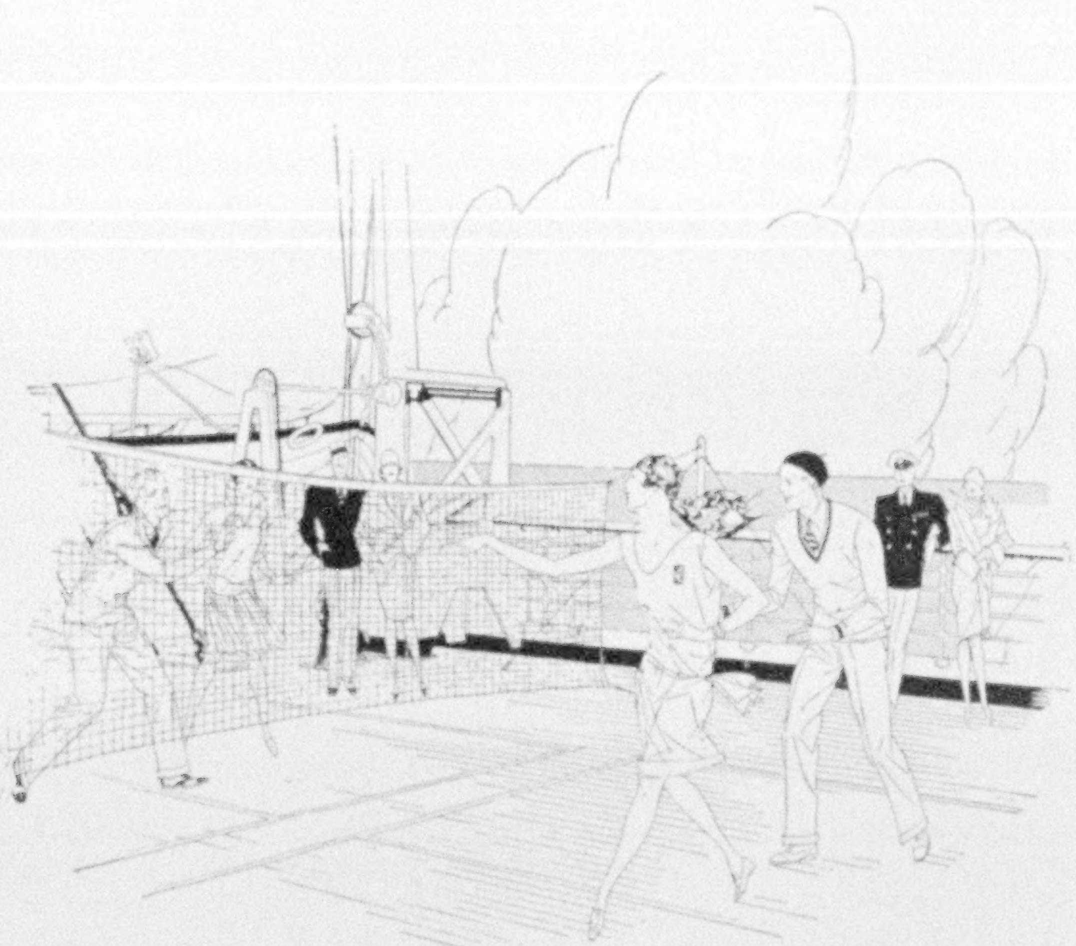
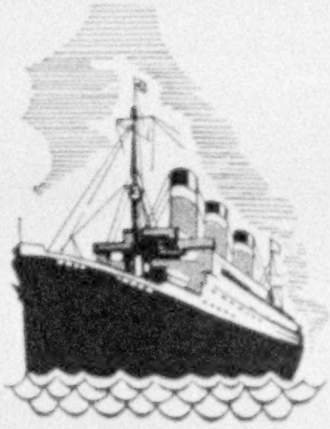
OFFICES IN 50 AMERICAN CITIES. INTERCONNECTED BY 11,000 MILES OF PRIVATE WIRES. INTERNATIONAL BRANCHES AND CONNECTIONS.



Why it pays

to go to Europe in Spring

TRY to sail in Spring, before the midsummer rush. More room on board. The nicest fellow travelers. Trains abroad not so crowded. Hotels and resorts more truly European. And your trip in Spring is less expensive, too. Now one more tip: *when* to go is important; *where* to go is worth knowing, too; but *how* to go ranks highest of all. Let those who know—the travel-wise—tell you about the famous meals served on American ships; the unexpected luxuries; the home-like stateroom that you'll learn to love; the prompt service of stewards who understand your language. Your steamship agent will recommend the *Leviathan,* the world's largest ship, if you're in a hurry—less than six days and you're there. For a more leisurely trip, select one of the cabin ships, *George Washington, America, Republic, President Harding,* or *President Roosevelt.*



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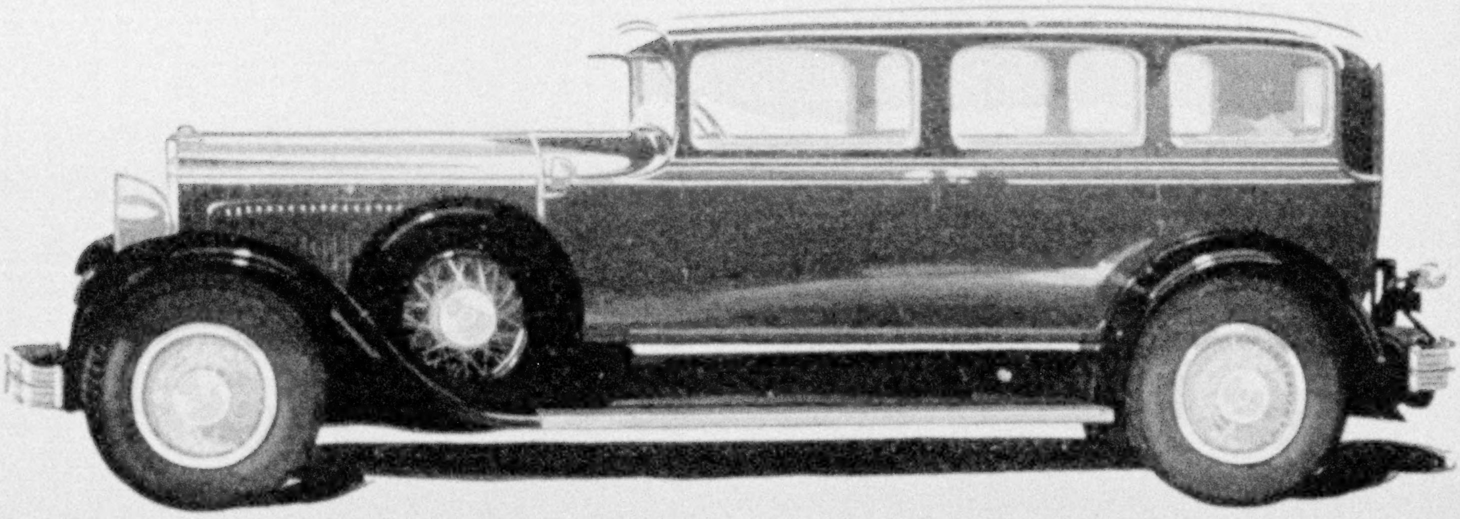

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All Chrysler models will be exhibited at the National Automobile Shows; and at special displays in the Commodore Hotel during the New York Show, Jan. 5th to 12th; and in the Balloon Room and entire lobby space of the Congress Hotel during the Chicago Show, Jan. 26th to Feb. 2nd.

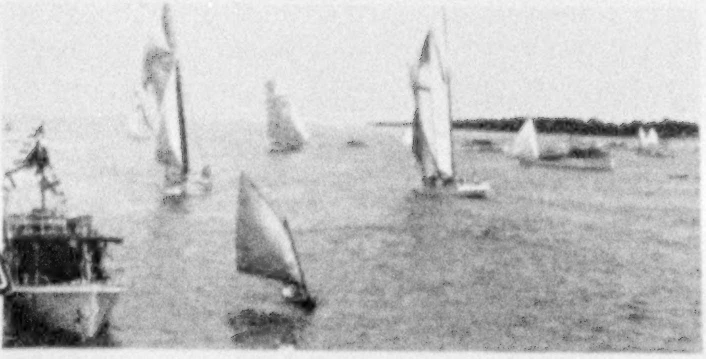
Get away from Snow and Ice ...take the *sun* and *fun* cure on *the* GULF COAST

where the temperature is just right (January average over 50°), where Nature is at her loveliest, and where there is so much to see and do that you'll regret it when the time comes to go home. No other winter playground holds more historic charm and interest. Five different peoples have ruled over these emerald shores and each regime has left its legends and its history. The Cherokee Rose, which blooms every month in the year in riotous profusion on the Coast, is said to have originated in this way:

"Father Davion, a French priest who was doing missionary work among the Indians along the Gulf Coast, became lost. Kneeling in prayer, he had a vision in which his mother appeared before him and told him that immediately on awakening in the morning he should follow the snow-white flower which would lead him back to his people. Upon arising, his gaze met this flower, which is now known as the Cherokee Rose, because it was among the Cherokees that he was working, and legend has it that he followed this rose to the banks of a stream. Wondering then how he would cross, he was amazed to see the vines grow over the water and so intertwine themselves as to form a bridge, over which he passed in safety and returned to his people at what is now Bay St. Louis, Mississippi." The Cherokee Rose is a gorgeously beautiful flower of "snowflake petals" and a "heart of golden light."

For scenic beauty, no winter vacation land surpasses the Gulf Coast.

Golf is glorious on the Coast—temperature just right, greens and fairways perfect. Splendid hunting (ducks, quail, etc.) fishing in deep water or inland streams, motoring over perfect roads, horseback riding through semi-tropical forests, tennis, boating, swimming in glass-enclosed pools. Good hotels, moderate rates. Write today for full information and particulars to R. D. Pusey, Gen. Pass. Agt., L. & N. Railroad, Room 322-C, 9th & Broadway, Louisville, Kentucky.



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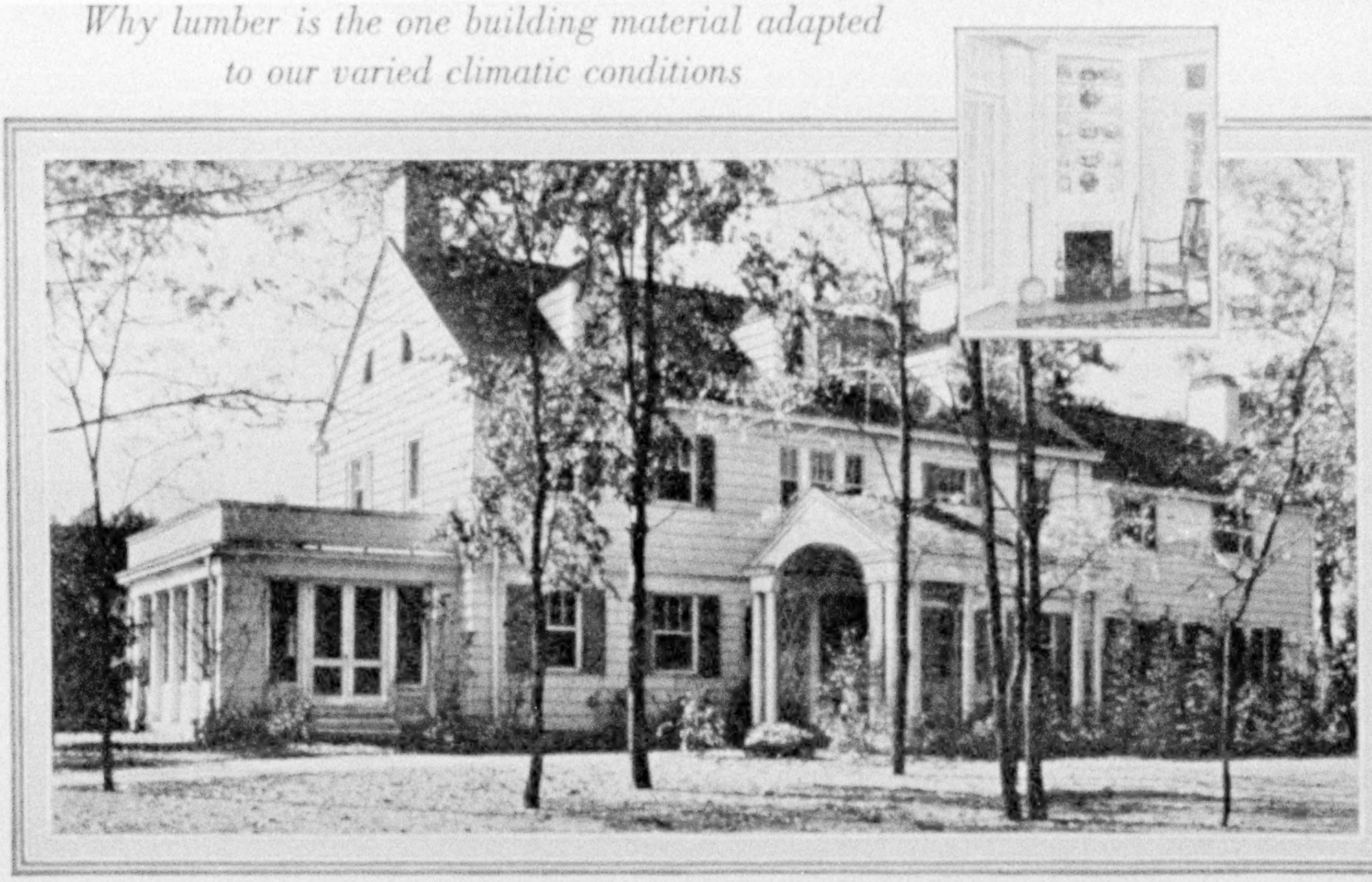

"American Standard Lumber from America's Best Mills"

Above . . . Architect Aymar Embury II

THESE 17 great associations affiliated with the National Association maintain service organizations that coordinate with the general technical services of the National staff:

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- California White & Sugar Pine Manufacturers Association, San Francisco, Calif.—California Pines, White Fir
- Hardwood Manufacturers Institute, Memphis, Tenn.—Oak, Gum, Southern and Appalachian Hardwoods
- North Carolina Pine Association, Norfolk, Va.—North Carolina Pine
- Northern Hemlock & Hardwood Manufacturers Association, Oshkosh, Wis.—Hemlock, Maple, Birch and Northern Hardwoods
- Northern Pine Manufacturers Association, Minneapolis, Minn.—White Pine, Norway Pine
- Southern Cypress Manufacturers Association, Jacksonville, Fla.—Cypress and Tupelo
- Southern Pine Association, New Orleans, La.—Long Leaf and Short Leaf Southern Yellow Pine
- West Coast Lumberman's Association, Seattle, Wash.—Douglas Fir, Sitka Spruce, West Coast Hemlock, Western Red Cedar
- Western Pine Manufacturers Association, Portland, Ore.—Pondosa Pine, Idaho White Pine, Larch
- National-American Wholesale Lumber Association, New York, N. Y.
- National Association of Wooden Box Manufacturers, Chicago, Ill.
- Maple Flooring Manufacturers Association, Chicago, Ill.
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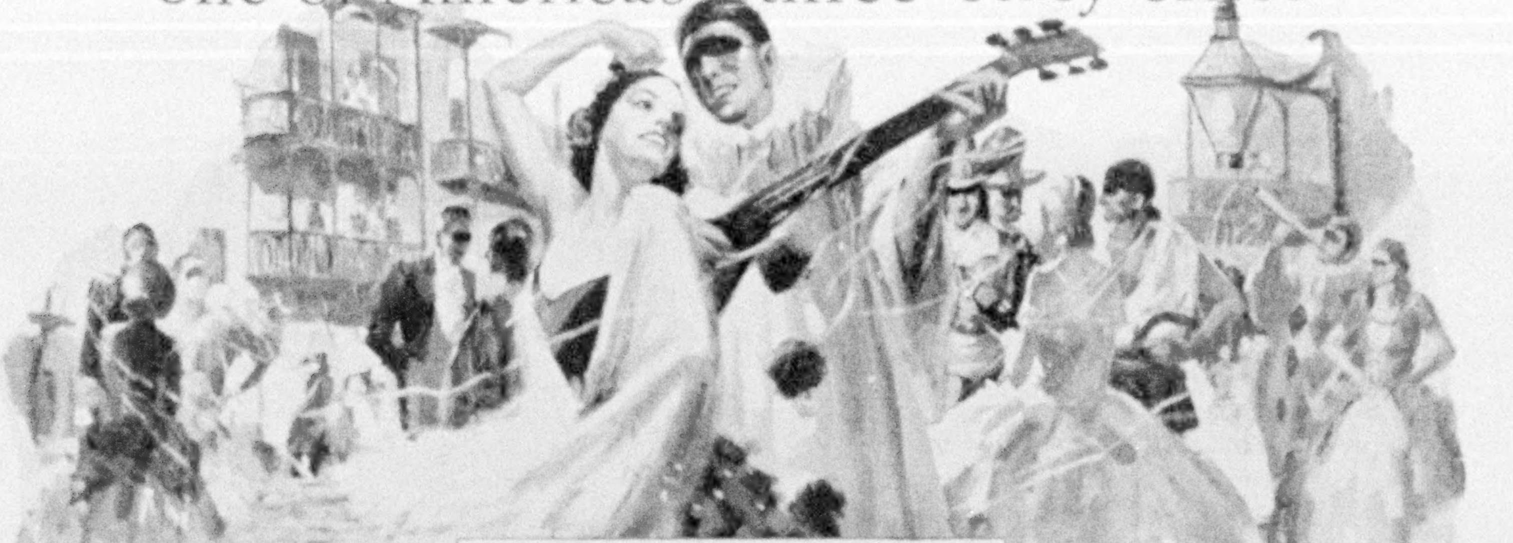
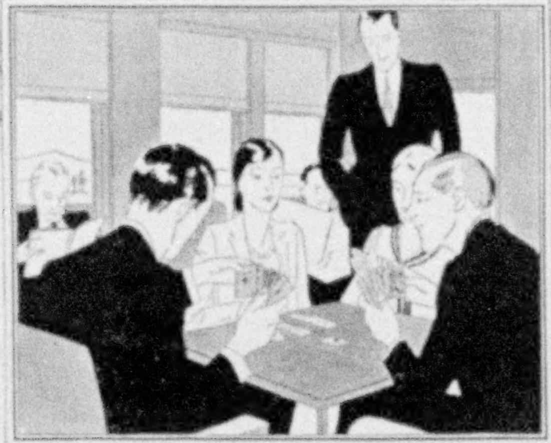


Mardi Gras,
the renowned New Orleans Mid-winter Carnival, January 7th to February 12th



And then, on to California!

Which are the three most interesting cities in America? Frank Norris, famous novelist, declared them to be New York, New Orleans and San Francisco. "Story cities", he called them.

Southern Pacific, by steamship and rail, presents all three of these fascinating cities to the traveler in a single journey. You can take comfortable Southern Pacific steamship at New York, enjoy "100 golden hours at sea" en route to California, and debark at New Orleans for a pleasurable stopover in the city that has lived under five flags.

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And then, continuing your journey on "*Sunset Limited*" or "*The Argonaut*", you will be carried swiftly and smoothly across Louisiana, Texas and the Spanish-American Southwest.

Travelers to the Pacific Coast via the Sunset Route may also start their journey from other points than New York, taking the most convenient rail lines to New Orleans. Return journey from California can be any one of *four* Southern Pacific routes. Stopovers may be taken anywhere. This affords opportunity to see the whole Pacific Coast.

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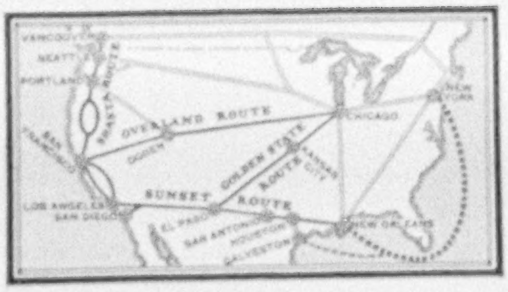
Your name and address to E. W. Clapp, traffic manager, Dept. C-26, 310 S. Michigan Blvd., Chicago, will bring you without charge a highly interesting book with illustrations and animated maps, "*How Best to See the Pacific Coast*", and a handsome brochure, "*New Orleans, the Crescent City*".



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Golden State Route—"*Golden State Limited*"
Overland Route—"*San Francisco Overland Limited*"
Shasta Route—"*The Cascade*"

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HAVE you ever seen a cod-fishing fleet scudding home, loaded to the plimsoll line with its catch? It's a thrilling sight for a land-lubber. On shore, weather-beaten men in oilskins and sou'westers stand waiting, ready for instant action — there must not be a moment's delay if the precious oil from the fish is to meet the exacting standards set up by Parke, Davis & Company.

The wealth of health-giving vitamins in Parke-Davis Standardized Cod-Liver Oil depends upon methods unknown a few years ago. Parke-Davis scientific experts helped materially to spread knowledge of these new methods among the fisherfolk of New England, Nova Scotia, and Newfoundland.

"Look lively, men!"

Every precaution is taken to preserve and stabilize the oil's vitamin content. The "rendering" often begins on the open sea, long before the ship makes port.

Then comes the refining. The fresh oil is chilled and filtered in order to remove the unpleasant "stearine." It is then piped into metal-lined containers which are hermetically sealed and shipped to our laboratories.

Now comes a most important step. The oil is tested for purity and is *standardized*—that is, biologically assayed for vitamin richness. It must do more than merely meet U. S. Pharmacopoeia standards; it must satisfy Parke-Davis standards. Any lot of oil that does not measure up to our own high requirements is promptly rejected.

Do you know these two important vitamins?

The benefits derived from taking cod-liver oil depend very largely on the vitamins it contains — growth-promoting Vitamin A and rickets-preventing Vitamin D. Physicians say that next to clear summer sunlight, vitamin-rich cod-liver oil best promotes strong healthy bones and sound teeth in growing children.

Cod-liver oil is needed more than ever during this season of shorter days and consequent lack of sunlight. Experience has taught parents as well as physicians that cod-liver oil helps the children through the winter.

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Standardized
Cod-Liver Oil

It is light in color, practically odorless, and free from harmful fats. It is so highly refined that it leaves no unpleasant after-taste.

It is so rich in vitamins that each teaspoonful contains as much Vitamin A as 1 pound of the best creamery butter, or 11 pints of whole milk, or 9 eggs; and as much Vitamin D as 7.5 eggs.

Ask your druggist for Parke-Davis Standardized Cod-liver Oil.

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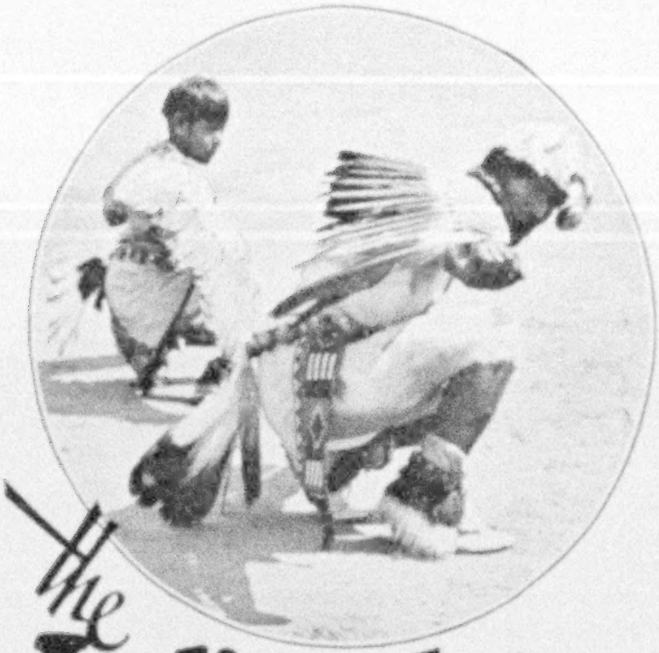

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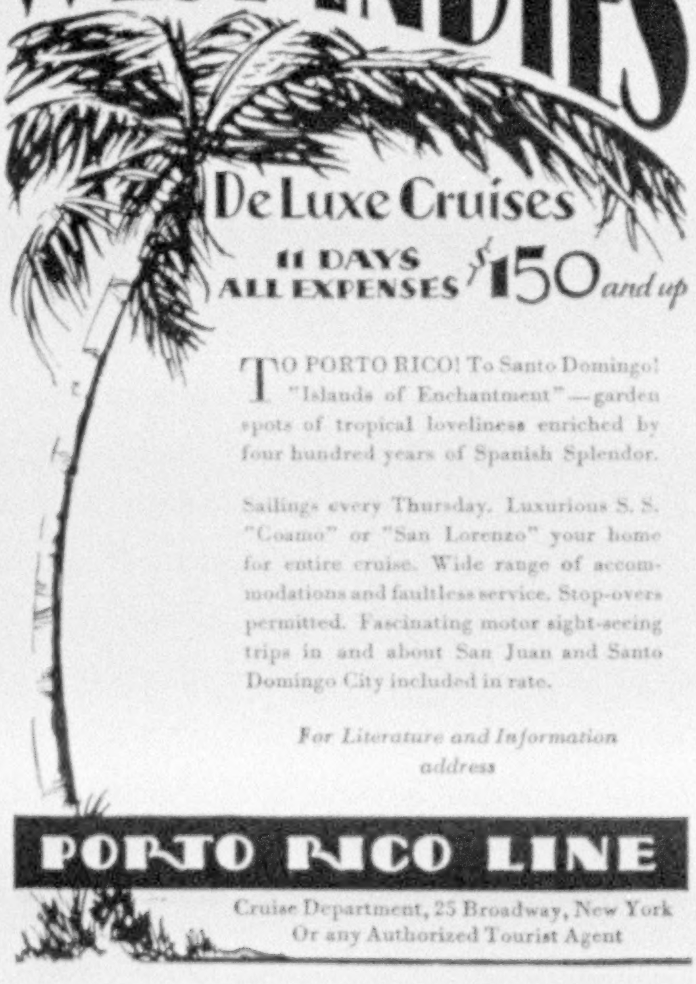

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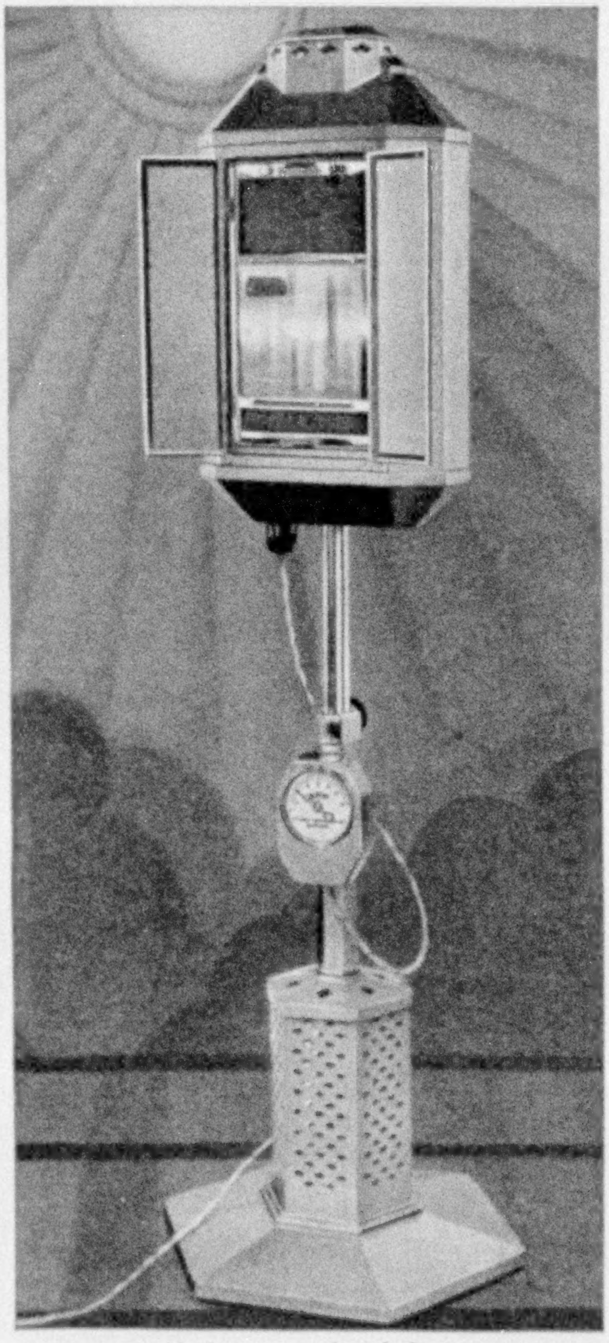
Turn on the July sun! Bask naked in the summer sunshine from

The Eveready Sunshine Lamp



Ask your physician

LET it storm! Let wind and rain and snow and sleet prison us indoors as they will—we can nullify the cheerless, sunless days by turning on the summer sun indoors.

This sounds like a miracle, but it is not. Science has placed the summer sun in our hands, for us to do with as we will. We turn on the summer sun by turning the switch on the Eveready Sunshine Lamp.

From this lamp pour all the essential rays of summer sunshine. It is a miniature summer sun, man-made. In its grateful, cheery, health-increasing glow you can bathe your entire body, in the privacy of your bedroom.

After testing light such as this, the U. S. Bureau of Standards said: "Of all the artificial illuminants tested, it is the nearest approach to sunlight."

The value of this lamp lies in its reproduction of all the essential rays of sunshine in their natural proportions. It is like sunshine itself, warming, strengthening, tanning with moderate exposures.

In every way the Eveready Sunshine Lamp is safe. It is shock-proof; no exposed live parts. A time clock is attached to be set at from one to thirty minutes, which prevents overexposure and possible sunburn. You may fall asleep under this grateful light with entire safety. The lamp stands firmly on its wide base. It rolls easily on casters.

The light from this lamp is not a cure-all, any more than the sun is. If you have any physical ailment, see your doctor, and do not attempt self-diagnosis.

But the vast majority of us are healthy and may use sunshine freely—cheering, stimulating, health-building sunshine—now available in every home from the Eveready Sunshine Lamp with Eveready Sunshine Carbons. Write for booklet explaining the health value of the light produced by this lamp. National Carbon Company, Inc., Cleveland, Ohio. UCC Unit of Union Carbide and Carbon Corporation.

The new Eveready Sunshine Lamp plugs into any convenience outlet. Price, complete with two pairs of special goggles and ten Eveready Sunshine Carbons, ready to operate, $137.50. For sale by electric lighting companies, electric specialty dealers and physicians' supply houses.

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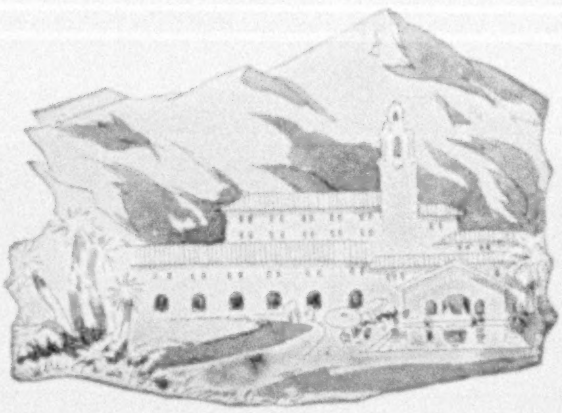
Sunshine Carbons

Eveready Sunshine Carbons

EVEREADY
Sunshine Lamp

Rock Island



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A fascinating itinerary with an added port of call—Casablanca—the playground of Morocco.

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Stop-over allowed in Europe, with privilege of returning on the new flagship "Statendam."

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After twenty-five years devoted exclusively to the manufacture of scientific hearing-aids, the Dictograph Products Co., Inc., Dept. 105-A, 220 West 42nd Street, New York City, has just perfected a new model Acousticon that represents the greatest advance yet made in the re-creation of hearing for the deaf. This latest Acousticon is featured by a tiny earpiece no bigger than a dime. Through this device, sounds are clearly and distinctly transmitted to subnormal ears with wonderful benefit to hearing and health alike. The makers offer an absolutely free trial for 10 days to any person who may be interested, and a letter will bring one of these remarkable aids to your home for a thorough and convincing test. Send them your name and address today! Advt.

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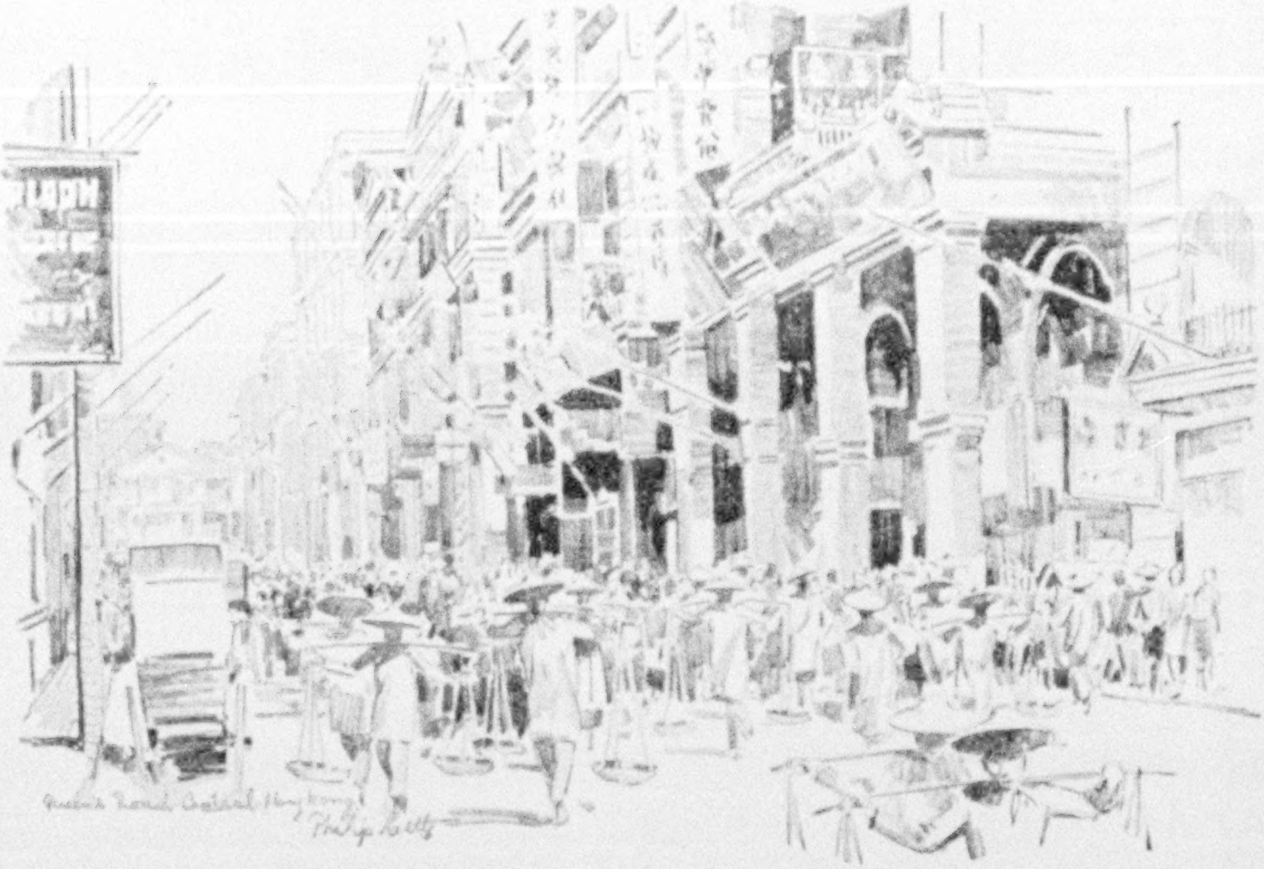
Queen's Road Central Hong Kong

Noted traveler* explains new way to see the World

Harry A. Franck, author-traveler, in the accompanying article, has described with great clarity the advantages of this unique steamship service. You go as you please, stopping where you please for as long as you like. Then when you are ready, continue on a similar ship in identical accommodations.

Every week a President Liner sails from Los Angeles and San Francisco for Honolulu, Yokohama, Kobe, Shanghai, Hong Kong and Manila, and fortnightly on to Singapore, Penang, Colombo, Suez, Port Said, Naples, Genoa, Marseilles and New York.

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*Harry A. Franck

World Traveler and Author of
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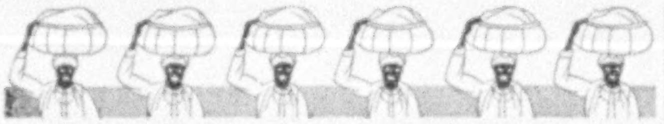

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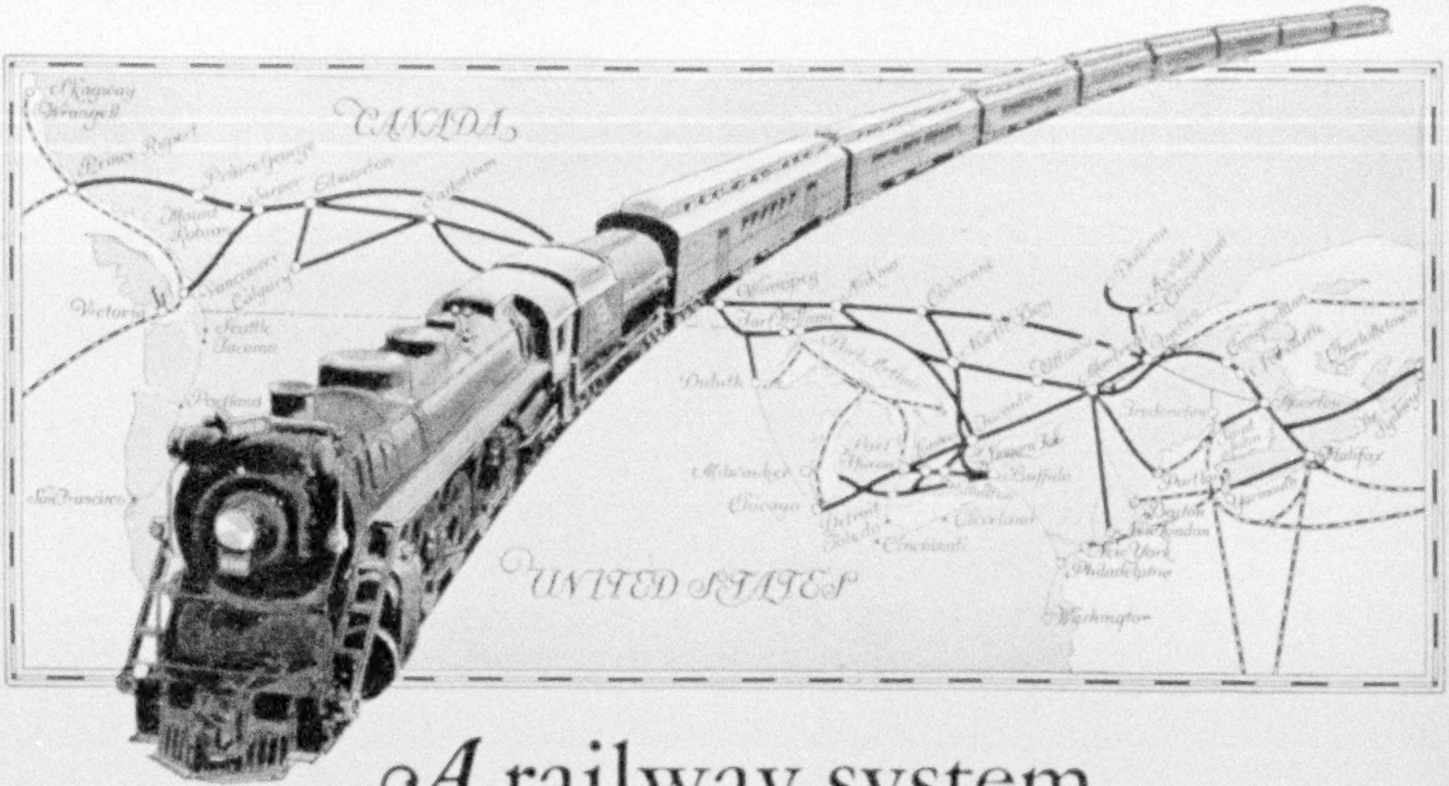
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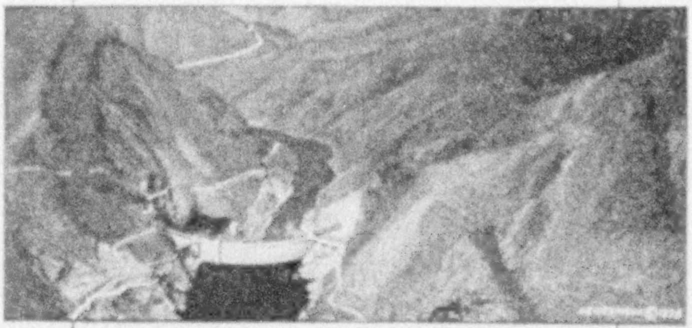

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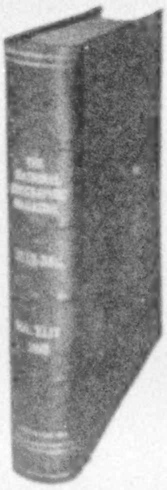

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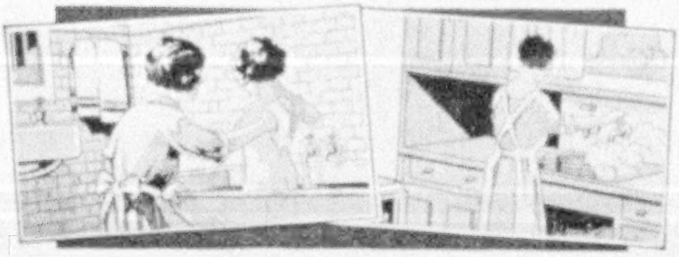

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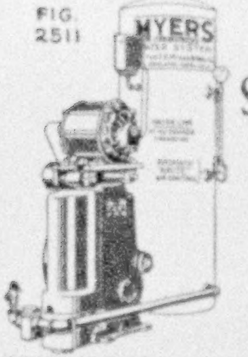

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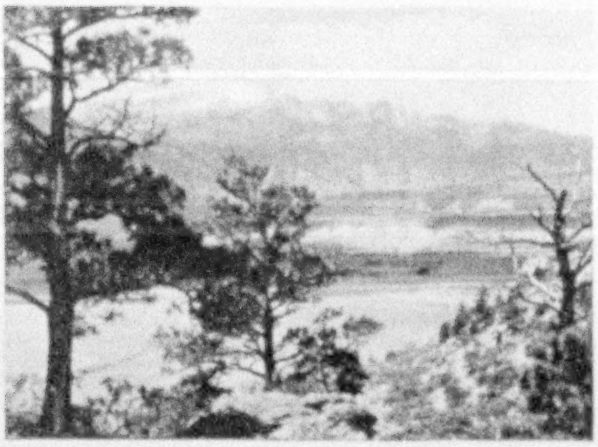

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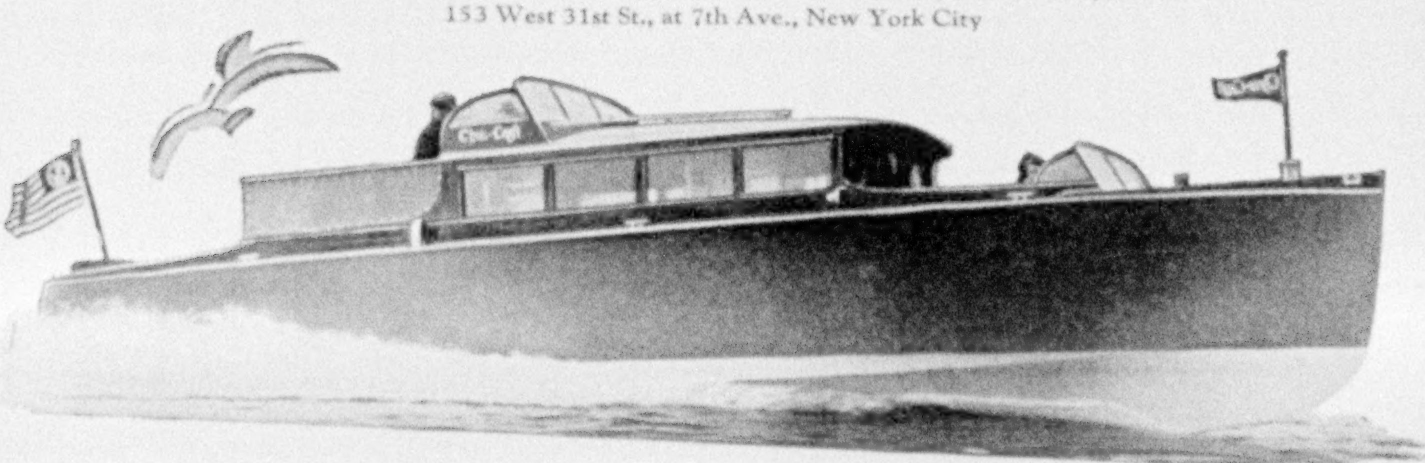

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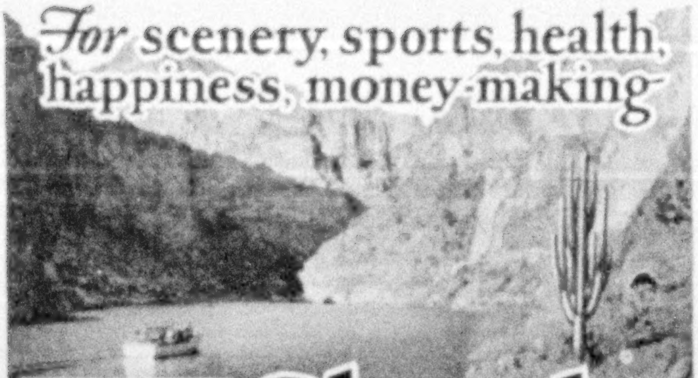

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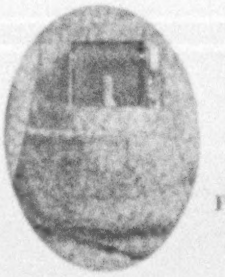

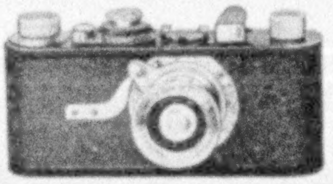

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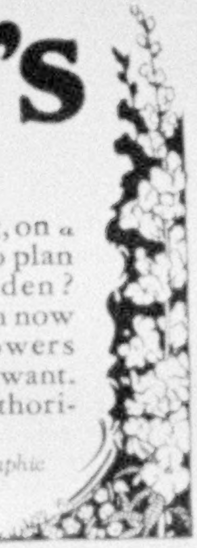

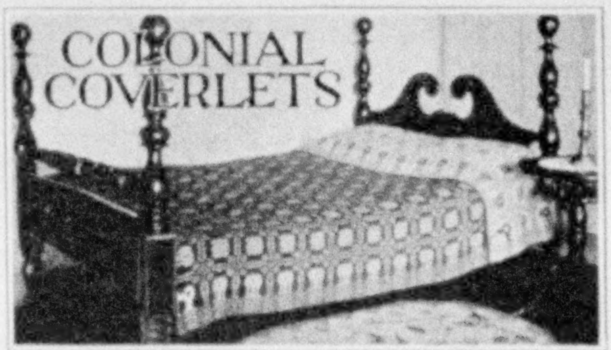

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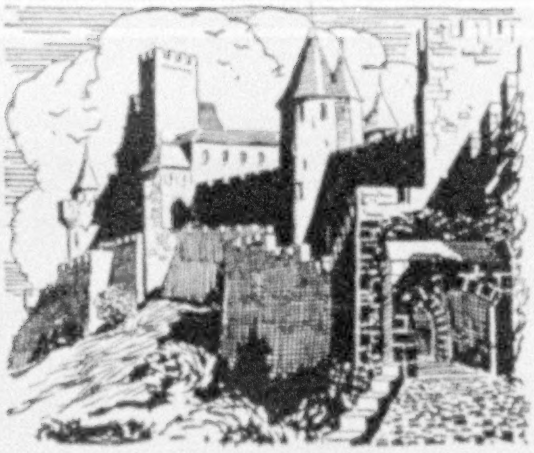

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Mediterranean Spring Cruise

Sailing April 8, on the S. S. "Carinthia"

¶ This is the only cruise ever to include in its program a visit to romantic *Carcassonne.* In its six weeks it goes also to such out-of-the-way places as *Casablanca* in Morocco, the *Balearic Islands, Malta, Corfu* and *Dalmatia* — and to *Spain, Algiers* and *Tunis, Sicily, Naples* and the *Riviera.* It is planned for either a complete Spring holiday or a voyage to Europe with extensive Mediterranean sight-seeing en route.

Rates, $725 and upward

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¶ With a 9-day side trip to Leningrad and Moscow. The complete northern cruise with visits to *Iceland, Norway, Sweden,* and *Denmark, Finland* and *Esthonia.* Sailing on June 26 on the S. S. "Carinthia." Rates, $800 and upward.

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¶ A new summer cruise along the European shores of the Mediterranean. With trips inland to *Vienna* and *Budapest,* the *Italian Lakes* and *Switzerland, Rome* and *Granada.* Sailing June 29 on the "Franconia." Rates, $800 and up.

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¶ To sail Jan. 21, 1930, on the S. S. "Columbus," largest and fastest liner that has ever sailed around the world.

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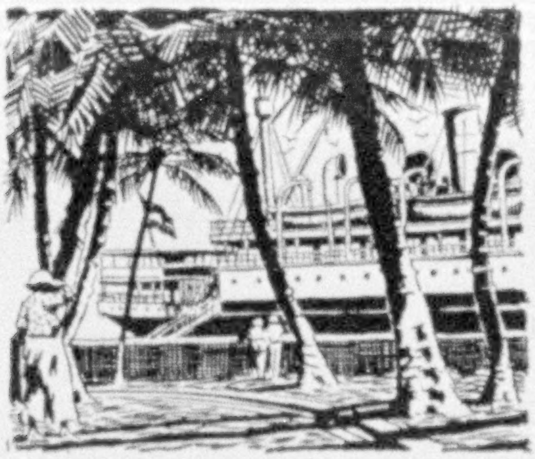

RAYMOND-WHITCOMB

West Indies Winter Cruises

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¶ Two midwinter cruises, each of 25 days, to the fascinating lands of the Caribbean — visiting Dutch *Curacao,* French *Martinique,* British *Barbados, Caracas* in Venezuela, *Nassau & Trinidad,* in addition to *Havana, Panama, Kingston &* other ports. For luxury and cuisine and service, the "Columbus" has no rival in West Indian Cruises. She is the largest and finest liner that has ever sailed to the Caribbean Sea.

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¶ A winter cruise which traverses the Mediterranean from end to end — spends 12 days in *Egypt* and the *Holy Land* — visits the historic cities, *Cyprus, Malta* and *Corsica,* and picturesque *Dalmatia.* Sailing Jan. 22 on the "Samaria."

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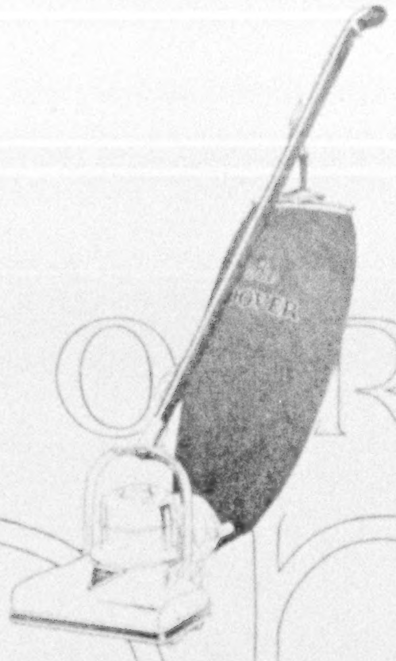
Agents in the principal cities



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The accurate measure of electric cleaner efficiency is *dirt per minute*

BECAUSE you can see the light, fluffy dust on the surface of your rugs, you are uncomfortable when it is there. Your rug isn't clean. When it is gone, you are satisfied! . . . You shouldn't be!

No rug is clean, if beneath the surface is accumulating a mass of gritty, caked dirt.

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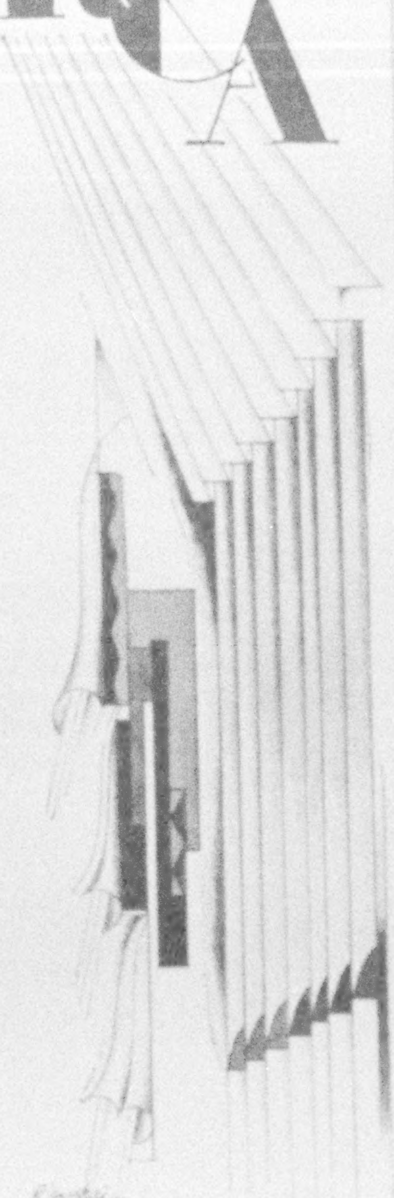

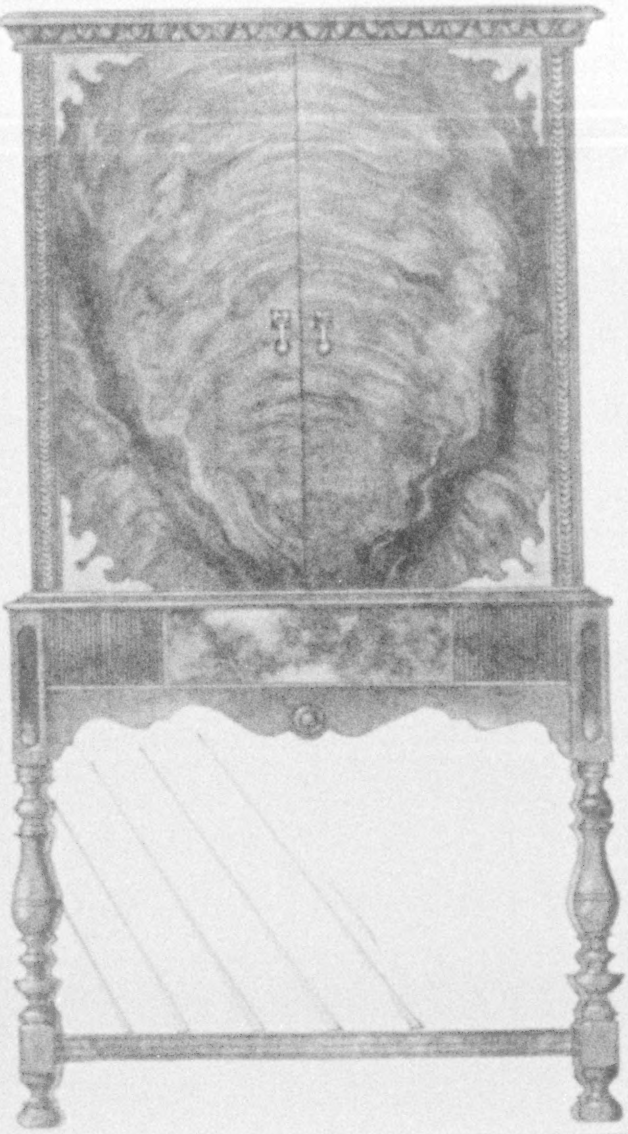

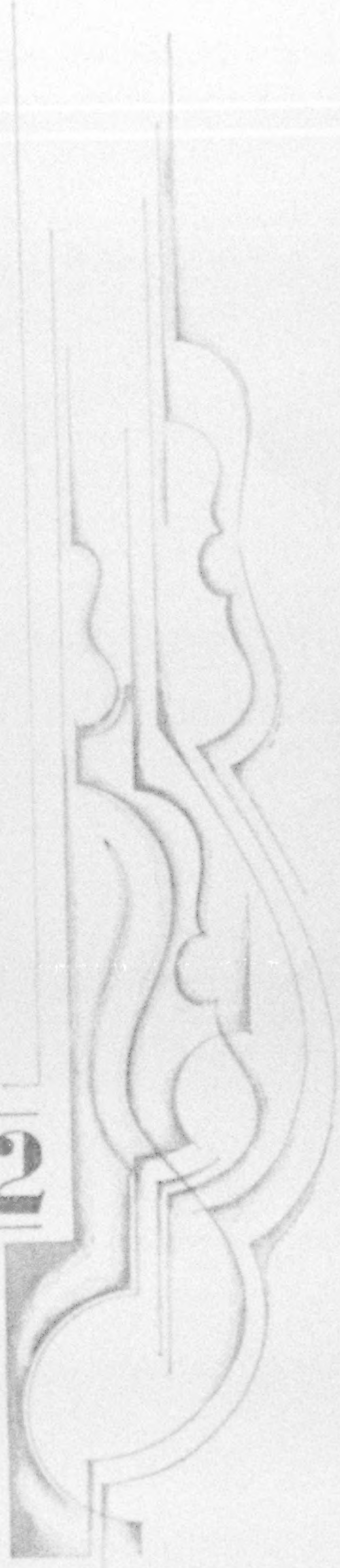

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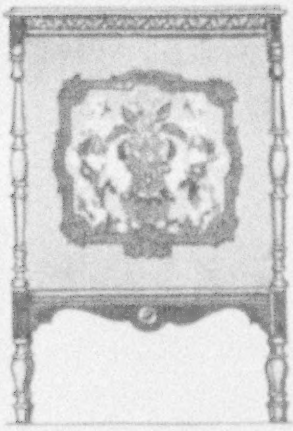

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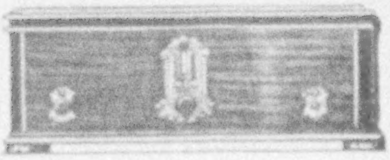

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